FINAL

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Based on: TOR Letter F. No. J-11011/359/2016- IA -II (I) dated 28th February, 2017

Prepared for

CRUX BIOTECH INDIA PRIVATE LIMITED

(Expansion of Grain based Distillery plant capacity from 60 KLPD to 75 KLPD capacity)

Peddavaram Village,

Nandigama Mandal,

Krishna District,

Andhra Pradesh.

July - 2017

Prepared by

PIONEER ENVIRO
LABORATORIES & CONSULTANTS PVT. LTD.

ISO 9001: 2008 Certified

Accredited by NABET

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Quality Council of India

National Accreditation Board for Education & Training

CERTIFICATE OF ACCREDITATION

This is to certify that

M/s Pioneer Enviro Laboratories & Consultants Pvt. Ltd., Hyderabad

is hereby accorded accreditation under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations (Version 3)

Scope of Accreditation:

Sl.No.	Name of the Sector	Cat.
1	Mining of minerals including opencast only	A
2	River Valley projects	A
3	Thermal power plants	A
4	Coal washeries	A
5	Mineral beneficiation	B
6	Metallurgical industries (ferrous & non ferrous)	A
7	Cement plants	A
8	Chlor-alkali industry	A
9	Chemical fertilizers	B
10	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	A
11	Distilleries	A
12	Sugar Industry	B
13	Industrial estates/ parks/ complexes/areas, export processing Zones(EPZs), Special Economic Zones(SEZs), Biotech Parks, Leather Complexes	A
14	Common Municipal Solid Waste Management Facility (CMSWMF)	B
15	Building and construction projects	B
16	Townships and Area development projects	B

Name of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes published on website dated July 12, 2016.

Accreditation to the above is subject to the EIA reports being prepared by the experts (EIA Coordinators and Functional area Expert) mentioned in the above minutes and compliance to the Terms and Conditions of Accreditation.

Certificate No: NABET/ EIA/1619/ RA 026

Valid Up to: June 22, 2019

(Subject to continual compliance to NABET scheme)

C.E.O
NABET

DECLARATION

Declaration by Experts contributing to the Final EIA report for the proposed expansion of Grain Based Distillery plant from 60 KLPD to 75 KLPD by **Crux Biotech India Private Limited** located in Sy.Nos.529p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh.

We, hereby, certify that we were part of the EIA team in the following capacity that developed the above EIA.

EIA Co-ordinator	**:**	Distillery		
Name	**:**	Mr. Y. Maheshwara Reddy		
Signature	**:**	Y M Reddy	**Date**	17/07/2017

DECLARATION BY FUNCTIONAL AREA EXPERTS INVOLVED IN THE PREPARATION OF EIA REPORT

FUNCTIONAL AREA	NAME OF THE EXPERT	INVOLVEMENT (PERIOD)	SIGNATURE
AP	Mr. Y. Maheshwara Reddy	Nov. 2016 to Jul. 2017	Y M Reddy
WP	Mr. Y. Maheshwara Reddy	Nov. 2016 to Jul. 2017	Y M Reddy
SHW	Mr. Y. Maheshwara Reddy	Nov. 2016 to Jul. 2017	Y M Reddy
AQ	Mr. Y. Maheshwara Reddy	Nov. 2016 to Jul. 2017	Y M Reddy
SE	Mr. I. Durga Prasad	Nov. 2016 to Jul. 2017	
EB	Prof. Bayyapu Reddy	Nov. 2016 to Jul. 2017	
SC	Prof. Bayyapu Reddy	Nov. 2016 to Jul. 2017	
HG	Mr. V. Tarun Chander	Nov. 2016 to Jul. 2017	
GEO	Mr. V. Tarun Chander	Nov. 2016 to Jul. 2017	
NV	Mr. B. Bhaskar Rao	Nov. 2016 to Jul. 2017	
LU	Dr. Y. Ramamohan	Nov. 2016 to Jul. 2017	
RH	Mr. D.H. Patel	Nov. 2016 to Jul. 2017	

INVOLVED AS	NAME OF THE PERSON	INVOLVEMENT (PERIOD)	SIGNATURE
Team Member	U. Venkatreddy	Nov. 2016 to Jul. 2017	U. Venkat Reddy

Declaration by the Head of the Accredited Consultant Organization

I, Y. Maheshwara Reddy, hereby, confirm that the above mentioned experts prepared the EIA for **Crux Biotech India Private Limited** for proposed expansion of Grain based distillery plant from 60 KLPD to 75 KLPD in Sy.Nos.529 p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh. I also confirm that I shall be fully accountable for any misleading information mentioned in this statement.

Signature : Y M Reddy

Name : Y.Maheshwara Reddy

Designation : Managing Director

Organization : Pioneer Enviro Laboratories & Consultants Private Limited

crux Biotech India (P) Limited
H.No. 8-3-222/C/1, A-26, Madhuranagar,
Ameerpet, Hyderabad-500 038. T.S., INDIA.
Ph: 040-66562830, Cell : 9133300679

UNDERTAKING

I, **Ravi Chandran Gogineni, Managing Director** of **Crux Biotech India Private Limited** give this undertaking to the effect that the TORs prescribed by MOEF&CC, New Delhi vide **F.N. J-11011/359/2016-IA -II (I) dated 28th February, 2017** for the proposed expansion of Grain Based Distillery plant from 60 KLPD to 75 KLPD in Sy.Nos.529 p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh has been complied with and the data submitted are factually correct.

Date : 26/06/2017

Place : Hyderabad

For: CRUX BIOTECH INDIA PRIVATE LIMITED

CRUX BIOTECH INDIA PVT. LTD. HYDERABAD

RAVI CHANDRAN GOGINENI
MANAGING DIRECTOR

Government of India
Ministry of Environment, Forest and Climate Change
(IA Division)

Indira Paryavaran Bhawan
Aliganj, Jor Bagh Road
New Delhi – 110 003

Yogendra Pal Singh
Scientist 'D'

Telefax: 91-11-24695365
E-mail : yogendra78@nic.in

F. No. J-11011/359/2016-IA-II (I)

Dated: 28th February, 2017

To,

The Director
M/s Crux Biotech India Pvt. Limited
8-3-222/C/1, A-26, Madhuranagar,
Ammerpet, Hyderabad - 500 038,
Andhra Pradesh

Sub: Expansion of capacity of existing Distillery (from 60 KLPD to 75 KLPD) at Sy. Nos. 529p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh by M/s Crux Biotech India Private Limited – Terms of Reference - reg.

Sir,

This has reference to your Proposal No. IA/AP/IND2/60879/2016 dated 05th December, 2016, submitting to this Ministry for seeking Terms of Reference (ToR) in terms of the provisions of the Environment Impact Assessment (EIA) Notification, 2006 under the Environment (Protection) Act, 1986.

2. The proposal was considered by the Expert Appraisal Committee (EAC) in the Ministry for (Industry-2), in its 17th meeting held on 26th – 29th December, 2016. The details of the project, as per the documents submitted by the project proponent, and also as informed during the meeting, are reported to be as under:-

(i) The project involves distillery (capacity enhancement from 60 KLPD to 75 KLPD at Sy.Nos.529 p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh by M/s Crux Biotech India Private Limited:

Plant	Product/ By Product	Existing	Expansion	After Expansion
Distillery (with Grains)	Rectified Spirit/ENA/Ethanol	60 KLPD	15 KLPD	75 KLPD
Power	Electricity	2.5 MW	---	2.5 MW

(ii) Since the proposal is for Enhancement of distillery plant production capacity from 60 KLPD to 75 KLPD with process modifications without installing additional machinery, no additional cost for the expansion project is envisaged.

(iii) Existing plant have 28.98 Acres, expansion will be taken up in the existing plant premises only.

(iv) Water requirement proposed for 60 KLPD distillery at the time of Environmental clearance in 2012 is 642 KLD. However, No increase in water requirement due to capacity enhancement and it remains 642 KLD only for 75 KLPD capacity.

(v) Water requirement for the distillery plant is being sourcing from Ground water & Krishna River at a distance of 1.3 Kms. from the plant. Permission has been obtained for drawl of 250 cum/day of ground water from Ground Water Department, Govt. of A.P. and same is shown in subsequent slides. I & CAD, GOAP has accorded permission to draw 800 KLD of water from Krishna River.

(vi) No additional Power & fuel will be required for expansion project.

(vii) Bag filters is already provided to the existing boiler to bring down the particulate matter to below 50 mg/Nm^3.

(viii) No additional waste water generation from the expansion project.

(ix) Used oil is being disposed to SPCB authorized recyclers and same will be followed.

(x) Nearest river is Krishna River at 1.3 Kms and nearest village is Peddavaram Village at 1.6 Kms.

(xi) No air emission will generate from expansion proposal as existing Boiler is sufficient for expansion also.

(xii) No additional effluent generation from the proposed expansion project.

(xiii) **CSR plan** - CSR plan will be furnished in the Final EIA report.

3. The Committee after detailed deliberations recommended the proposal for grant of additional TOR alongwith Standard TOR as available on the Ministry's website.

4. As per the recommendations of the EAC, the Ministry of Environment, Forest and Climate Change hereby accords following additional TOR for preparation of the Environment Impact Assessment (EIA) Report and Environment Management Plan (EMP) in respect of the ***"Expansion of capacity of existing Distillery (from 60 KLPD to 75 KLPD) at Sy. Nos. 529p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh by M/s Crux Biotech India Private Limited".***

Specific TOR

(i) A separate chapter on status of compliance of Environmental Clearance conditions granted by the State/Centre to be provided. As per circular dated 30th May, 2012 issued by MoEF a certified report by concerned

RO, MoEF&CC on status of compliance of conditions of EC for the existing unit to be provided in EIA/EMP report.

(ii) Study report on emissions and their impact on nearby forest area to be submitted with EIA/EMP report.

(iii) Public Consultation would be exempted under para 7 (ii) of the EIA Notification, 2006, as the EC granted in 2012 and PH already done at that time.

(iv) Lay out plan to be submitted making provision for 10 m wide Green Belt of perennial indigenous tree species (2000 nos. trees of Neem, Seasam, Teak wood etc.) around plant periphery.

5. You are requested to kindly submit the detailed final EIA/EMP prepared as per ToRs to the Ministry for considering the proposal for environmental clearance ***within 3 years as per the MoEF&CC O. M. No.J-11013/41/2006-IA-II (I) (P) dated 8th October, 2014***.

6. As per circular dated 30th May, 2012 issued by this Ministry a certified report by concerned RO, MoEF&CC on status of compliance of conditions of EC for the existing unit to be provided in EIA/EMP report.

7. The consultants involved in preparation of EIA/EMP report after accreditation with Quality Council of India/National Accreditation Board of Education and Training (QCI/NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other Organization(s)/Laboratories including their status of approvals etc. vide notification of the MoEF dated 19th July, 2013.

28.2.2017

(Yogendra Pal Singh)
Scientist 'D'

Copy to:

1. The Chairman, Andhra Pradesh Pollution Control Board, Paryavarna Bhawan, A-3, Industrial Area, Sanathnagar, Hyderabad - 500 018, Andhra Pradesh.

28.2.2017

(Yogendra Pal Singh)
Scientist 'D'

TOR COMPLIANCE

Compliance made on Terms of Reference (TOR) issued by Ministry of Environment, Forest & Climate Change (MoEF & CC), New Delhi vide letter No. F.N. J-11011/359/2016-IA -II (I) dated 28th February, 2017 to Crux Biotech India Private Limited.

SPECIFIC TOR

TOR No.	TOR POINT	TOR COMPLIANCE
1.	Specific chapter on status of compliance of Environmental Clearance conditions granted by the State/ Center to be provided. As per circular dated 30th May, 2012 issued by MOEF a certified report by concerned RO, MOEF&CC on status of compliance of conditions of EC for the existing unit to be provided in EIA/EMP report.	**Kindly refer to ANNEXURE – 1.**
2.	Study report on emissions and impact on nearby forest area to be submitted with EIA/EMP report.	**Kindly refer to Page No. 4.15 and to 4.16 of Chapter-4 of Final EIA report**
3.	Public Consultation would be exempted under para 7 (ii) of the EIA Notification, 2006, as the EC granted in 2012 and PH already done at that time.	**Public Hearing is exempted**
4.	Lay out plan to be submitted making provision for 10 m wide Green Belt of perennial indigenous tree species (2000 nos. Trees of Neem, Seasam, Teak wood etc.) around plant periphery.	**Kindly refer to ANNEXURE – 2**

GENERIC TERMS OF REFERENCE (TOR)

TOR No.	TOR Point	TOR Compliance
1.	Executive Summary	**Kindly refer to Page No. 11.1 and to 11.7 of Chapter-11 of Final EIA report**
2.	Introduction	
	i. Details of the EIA Consultant including NABET accreditation	**Crux Biotech India Private Limited have appointed M/s. Pioneer Enviro Laboratories & Consultant Private Limited, Hyderabad as EIA consultant and their accreditation certificate issued by Quality Council of India and NABET, New Delhi is shown ANNEXURE – 3.**
	ii. Information about the project proponent	**Kindly refer to page no. 1.2 & 1.3 of Chapter – 1 of Final EIA report.**
	iii. Importance and benefits of the project	**Kindly refer to page no. 1.4 & 1.5 of Chapter – 1 of Final EIA report.**
3.	Project Description	
	i. Cost of project and time of completion.	**Kindly refer to page no. 2.9 of Chapter – 2 of Final EIA report.**
	ii. Products with capacities for the proposed project.	**Kindly refer to page no. 2.9 of Chapter – 2 of Final EIA report.**
	iii. If expansion project, details of existing products with capacities and whether adequate land is available for expansion, reference of earlier EC if any.	**Kindly refer to page no. 1.3 of Chapter – 1 of Final EIA report.**
	iv. List of raw materials required and their source along with mode of transportation	**Kindly refer to page no. 2.9 & 2.10 of Chapter – 2 of Final EIA report.**
	v. Other chemicals and materials required with quantities and storage capacities	**Other Chemical like Urea is used as nutrients for fermentation.** **Antifoam agents – 0.25 Kg/kl of alcohol (will be stored in Drums)** **Urea – 1 Kg/Kl of alcohol (will be stored in PPE Bags)** **Enzymes like Alpha amylase – 0.35 kg/Ton of starch and alpha gluco amylase – 0.8 Kg/ ton of starch (will be stored in Gerikin bags)**
	vi. Details of Emission, effluents, hazardous waste	**Kindly refer to page no. 10.1 to 10.10 of Chapter – 10 of Final EIA report.**

TOR No.	TOR Point	TOR Compliance
	generation and their management.	
	vii. Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract)	**Water requirement & water balance diagram is furnished in page no. 4.7 & 4.8 of Chapter-4 of Final EIA report.** **Kindly refer to ANNEXURE – 4 for water drawl permissions obtained** **Power required for existing and expansion will be sourced from existing co-gen power plant.** **There will not be any increase in employment due to the capacity enhancement. The existing plant created employment to 150 people during operation of the 60 KLPD plant and the same is sufficient for expansion also.**
	viii. Process description along with major equipments and machineries, process flow sheet (quantitative) from raw material to products to be provided	**Kindly refer to page no. 2.11 to 2.20 of Chapter -2 of Final EIA report.**
	ix. Hazard identification and details of proposed safety systems.	**Kindly refer to page no. 7.1 to 7.12 of Chapter 7 of Final EIA report.**
	x. Expansion/modernization proposals:	
	a. Copy of all the Environmental Clearance(s) including Amendments thereto obtained for the project from MOEF/SEIAA shall be attached as an Annexure. A certified copy of the latest Monitoring Report of the Regional Office of the Ministry of Environment and Forests as per circular dated 30th May, 2012 on the status of compliance of conditions stipulated in all	**Kindly refer to ANNEXURE – 1.**

TOR No.	TOR Point	TOR Compliance
	the existing environmental clearances including Amendments shall be provided. In addition, status of compliance of Consent to Operate for the ongoing / existing operation of the project from SPCB shall be attached with the EIA-EMP report.	
	b. In case the existing project has not obtained environmental clearance, reasons for not taking EC under the provisions of the EIA Notification 1994 and/or EIA Notification 2006 shall be provided. Copies of Consent to Establish/No Objection Certificate and Consent to Operate (in case of units operating prior to EIA Notification 2006, CTE and CTO of FY 2005-2006) obtained from the SPCB shall be submitted. Further, compliance report to the conditions of consents from the SPCB shall be submitted.	**Environmental Clearance was obtained from MOEF&CC, New Delhi to Existing plant, hence not applicable**
4.	Site Details	
	i. Location of the project site covering village, Taluka/Tehsil, District and State, Justification for selecting the site, whether other sites were considered.	**Kindly refer to page no. 5.1 & 5.2 of Chapter-5 of Final EIA report.**
	ii. A toposheet of the study area of radius of 10km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet, (including all eco-sensitive areas and environmentally sensitive places)	**Kindly refer to page no.2.4 of Chapter 2 of Final EIA report.**

TOR No.	TOR Point	TOR Compliance
	iii. Details w.r.t. option analysis for selection of site	**Kindly refer to page no. 5.1 & 5.2 of Chapter-5 of Final EIA report.**
	iv. Co-ordinates (lat-long) of all four corners of the site.	**Kindly refer to page no.2.1 & 2.2 of Chapter-2 of Final EIA report.**
	v. Google map-Earth downloaded of the project site.	**Kindly refer to page no.2.5 of Chapter-2 of Final EIA report.**
	vi. Layout maps indicating existing unit as well as proposed unit indicating storage area, plant area, greenbelt area, utilities etc. If located within an Industrial area/Estate/Complex, layout of Industrial Area indicating location of unit within the Industrial area/Estate.	**Kindly refer to ANNEXURE – 2 for plant layout.** **Project is not located in Industrial area/Estate/Complex**
	vii. Photographs of the proposed and existing (if applicable) plant site. If existing, show photographs of plantation/greenbelt, in particular.	**Kindly refer to page no. 2.6 of Chapter-2 of Final EIA report.**
	viii. Landuse break-up of total land of the project site (identified and acquired), government/ private - agricultural, forest, wasteland, water bodies, settlements, etc shall be included, (not required for industrial area)	**Kindly refer to page no. 2.8 & 2.9 of Chapter-2 of Final EIA report.**
	ix. A list of major industries with name and type within study area (10km radius) shall be incorporated. Land use details of the study area	**Kindly refer to page no. 2.7 of Chapter – 2 of Final EIA report.** **Kindly refer to page no. 3.27 & 3.28 of Chapter-3 of Final EIA report**.
	x. Geological features and Geo-hydrological status of the study area shall be included.	**Kindly refer to page no. 3.28 of Chapter-3 of Final EIA report.**
	xi. Details of Drainage of the project upto 5km radius of study area. If the site is within 1 km radius of any major	**Kindly refer to ANNEXURE – 5 for Drainage patter map of the study area.**

TOR No.	TOR Point	TOR Compliance
	river, peak and lean season river discharge as well as flood occurrence frequency based on peak rainfall data of the past 30 years. Details of Flood Level of the project site and maximum Flood Level of the river shall also be provided, (mega green field projects)	**There are no major rivers within 1 Km. radius of plant site. Krishna river is present at distance of 1.3 Kms. From the plant site.**
	xii. Status of acquisition of land. If acquisition is not complete, stage of the acquisition process and expected time of complete possession of the land.	**Kindly refer to page no. 2.8 of Chapter – 2 of Final EIA report.**
	xiii. R&R details in respect of land in line with state Government policy	**The proposed expansion will be taken up in the existing plant premises. Hence not applicable, as no habitation is present in the plant area.**
5.	Forest and wildlife related issues (if applicable):	
	i. Permission and approval for the use of forest land (forestry clearance), if any, and recommendations of the State Forest Department, (if applicable)	**Not applicable, as no forest land is involved in the plant site.**
	ii. Landuse map based on High resolution satellite imagery (GPS) of the proposed site delineating the forestland (in case of projects involving forest land more than 40 ha)	**Kindly refer to page no. 3.29 & 3.30 of Chapter-3 of Final EIA report.** **Kindly refer to ANNEXURE – 6 for satellite image based on land use/land cover**
	iii. Status of Application submitted for obtaining the stage I forestry clearance along with latest status shall be submitted.	**Not applicable, as no forest land is involved in the plant site.**
	iv. The projects to be located within 10 km of the National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals, the project proponent shall	**No National Parks, Sanctuaries, Biosphere Reserves, Migratory Corridors of Wild Animals are present within 10 Kms. radius of the plant site.**

TOR No.	TOR Point	TOR Compliance
	submit the map duly authenticated by Chief Wildlife Warden showing these features vis-a-vis the project location and the recommendations or comments of the Chief Wildlife Warden-thereon	
	v. Wildlife Conservation Plan duly authenticated by the Chief Wildlife Warden of the State Government for conservation of Schedule I fauna, if any exists in the study area	**Not applicable, as no Schedule-I fauna exists within 10 Km.s for the plant site.**
	vi. Copy of application submitted for clearance under the Wildlife (Protection) Act, 1972, to the Standing Committee of the National Board for Wildlife	**Not applicable**
6.	Environmental Status	
	i. Determination of atmospheric inversion level at the project site and site-specific micro-meteorological data using temperature, relative humidity, hourly wind speed and direction and rainfall.	**Kindly refer to page no.4.2 to 4.6 of Chapter-4 of Final EIA report.** **Kindly refer to page no. 3.1 to 3-3 of Chapter-3 of Final EIA report.**
	ii. AAQ data (except monsoon) at 8 locations for PM_{10}, $PM_{2.5}$, SO_2, NOx, CO and other parameters relevant to the project shall be collected. The monitoring stations shall be based CPCB guidelines and take into account the pre-dominant wind direction, population zone and sensitive receptors including reserved forests.	**Kindly refer to page no. 3.4 to 3.9 of Chapter-3 of Final EIA report.**
	iii. Raw data of all AAQ measurement for 12 weeks of all stations as per frequency given in the NAQQM	**Kindly refer to ANNEXURE – 7 for Ambient Air Quality data collected during Post Monsoon.**

TOR No.	TOR Point	TOR Compliance
	Notification of Nov. 2009 along with - min., max., average and 98% values for each of the AAQ parameters from data of all AAQ stations should be provided as an annexure to the EIA Report.	
	iv. Surface water quality of nearby River (100m upstream and downstream of discharge point) and other surface drains at eight locations as per CPCB/MoEF&CC guidelines.	**Kindly refer to page no. 3.14 & 3.17 of Chapter 3 of Final EIA report.**
	v. Whether the site falls near to polluted stretch of river identified by the CPCB/MoEF&CC, if yes give details.	**Not applicable**
	vi. Ground water monitoring at minimum at 8 locations shall be included,	**Kindly refer to page no. 3.18 to 3.27 of Chapter-3 of Final EIA report.**
	vii. Noise levels monitoring at 8 locations within the study area	**Kindly refer to page no. 3.12 & 3.13 of Chapter-3 of Final EIA report.**
	viii. Soil Characteristic as per CPCB guidelines.	**Kindly refer to page no. 3.31 to 3.36 of Chapter-3 of Final EIA report.**
	ix. Traffic study of the area, type of vehicles, frequency of vehicles for transportation of materials, additional traffic due to proposed project, parking arrangement etc.	**Kindly refer to page no. 4.12 to 4.14 of Chapter-4 of Final EIA report.**
	x. Detailed description of flora and fauna (terrestrial and aquatic) existing in the study area shall be given with special reference to rare, endemic and endangered species. If Schedule-I fauna are found within the study area, a Wildlife Conservation Plan shall be prepared and furnished.	**Kindly refer to page no. 3.37 to 3.47 of Chapter-3 of Final EIA report.**

TOR No.	TOR Point	TOR Compliance
	xi. Socio-economic status of the study area.	**Kindly refer to page no. 3.48 to 3.59 of Chapter-3 of Final EIA report.**
7.	Impact and Environment Management Plan	
	i. Assessment of ground level concentration of pollutants from the stack emission based on site-specific meteorological features. In case the project is located on a hilly terrain, the AQIP Modelling shall be done using inputs of the specific terrain characteristics for determining the potential impacts of the project on the AAQ. Cumulative impact of all sources of emissions (including transportation) on the AAQ of the area shall be assessed. Details of the model used and the input data used for modelling shall also be provided. The air quality contours shall be plotted on a location map showing the location of project site, habitation nearby, sensitive receptors, if any.	**Kindly refer to page no.4.2 to 4.6 of Chapter-4 of Final EIA report** **Kindly refer to ANNEXURE – 8 for air quality contours plotted on a location map.**
	ii. Water Quality modelling - in case of discharge in water body	**Not applicable, no wastewater will be discharged outside the plant premises.**
	iii. Impact of the transport of the raw materials and end products on the surrounding environment shall be assessed and provided. In this regard, options for transport of raw materials and finished products and wastes (large quantities) by rail or rail-cum road transport or conveyor-cum-rail transport shall be examined.	**Kindly refer to page no. 4.12 to 4.14 of Chapter-4 of Final EIA report.**

TOR No.	TOR Point	TOR Compliance
	iv. A note on treatment of wastewater from different plant operations, extent recycled and reused for different purposes shall be included. Complete scheme of effluent treatment. Characteristics of untreated and treated effluent to meet the prescribed standards of discharge under E(P) Rules.	**Kindly refer to page no. 10.3 to 10.5 of Chapter-10 of Final EIA report.** **Kindly refer to page no. 4.9 & 4.10 of Chapter-4 of Final EIA report.**
	v. Details of stack emission and action plan for control of emissions to meet standards.	**Kindly refer to page no. 4.5 of Chapter 4 of Final EIA report** **Kindly refer to page no. 10.2 of Chapter – 10 of Final EIA report for action plan for control of emissions to meet standards.**
	vi. Measures for fugitive emission control	**Kindly refer to page no. 10.2 of Chapter-10 of Final EIA report.**
	vii. Details of hazardous waste generation and their storage, utilization and management. Copies of MOU regarding utilization of solid and hazardous waste in cement plant shall also be included. EMP shall include the concept of waste-minimization, recycle / reuse / recover techniques, Energy conservation, and natural resource conservation.	**Kindly refer to page no. 10.5 & 10.6 of Chapter – 10 of Final EIA report.**
	viii. Proper utilization of fly ash shall be ensured as per Fly Ash Notification, 2009. A detailed plan of action shall be provided.	**Kindly refer to page no. 10.5 & 10.6 of Chapter – 10 of Final EIA report.**

TOR No.	TOR Point	TOR Compliance
	ix. Action plan for the green belt development plan in 33 % area i.e. land with not less than 1,500 trees per ha. Giving details of species, width of plantation, planning schedule etc. shall be included. The green belt shall be around the project boundary and a scheme for greening of the roads used for the project shall also be incorporated.	**Kindly refer to page no. 10.7 & 10.8 of Chapter – 10 of Final EIA report.**
	x. Action plan for rainwater harvesting measures at plant site shall be submitted to harvest rainwater from the rooftops and storm water drains to recharge the ground water and also to use for the various activities at the project site to conserve fresh water and reduce the water requirement from other sources.	**Kindly refer to page no. 10.8 of Chapter – 10 of Final EIA report.**
	xi. Total capital cost and recurring cost/annum for environmental pollution control measures shall be included.	**Kindly refer to page no. 10.9 of Chapter – 10 of Final EIA report.**
	xii. Action plan for post-project environmental monitoring shall be submitted.	**Kindly refer to page no. 10.8 & 10.9 of Chapter – 10 of Final EIA report.**
	xiii. Onsite and Offsite Disaster (natural and Man-made) Preparedness and Emergency Management Plan including Risk Assessment and damage control. Disaster management plan should be linked with District Disaster Management Plan.	**Kindly refer to page no. 7.1 to 7.12 of Chapter 7 of Final EIA report.**
8.	Occupational Health	

TOR No.	TOR Point	TOR Compliance
	i. Plan and fund allocation to ensure the occupational health & safety of all contract and casual workers	**Kindly refer to page no. 7.21 to 7.27 of Chapter – 7 of Final EIA report.**
	ii. Details of exposure specific health status evaluation of worker. If the workers' health is being evaluated by pre designed format, chest x rays, Audiometry, Spirometry, Vision testing (Far & Near vision, colour vision and any other ocular defect) ECG, during pre-placement and periodical examinations give the details of the same. Details regarding last month analyzed data of above mentioned parameters as per age, sex, duration of exposure and department wise.	**Kindly refer to page no. 7.21 to 7.27 of Chapter – 7 of Final EIA report.**
	iii. Details of existing Occupational & Safety Hazards. What are the exposure levels of hazards and whether they are within Permissible Exposure level (PEL). If these are not within PEL, what measures the company has adopted to keep them within PEL so that health of the workers can be preserved,	**Kindly refer to page no. 7.21 to 7.27 of Chapter – 7 of Final EIA report.**
	iv. Annual report of health status of workers with special reference to Occupational Health and Safety.	**Kindly refer to page no. 7.21 to 7.27 of Chapter – 7 of Final EIA report.** **Kindly refer to ANNEXURE -9 for health report of the employee.**
9.	Corporate Environment Policy	
	i. Does the company have a well laid down Environment Policy approved by its Board of Directors? If so, it may be detailed in the EIA report.	**Kindly refer to ANNEXURE - 10**
	ii. Does the Environment Policy prescribe for standard	

TOR No.	TOR Point	TOR Compliance
	operating process / procedures to bring into focus any infringement / deviation / violation of the environmental or forest norms / conditions? If so, it may be detailed in the EIA.	
	iii. What is the hierarchical system or Administrative order of the company to deal with the environmental issues and for ensuring compliance with the environmental clearance conditions? Details of this system may be given.	
	iv. Does the company have system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the company and / or shareholders or stakeholders at large? This reporting mechanism shall be detailed in the EIA report	
10.	Details regarding infrastructure facilities such as sanitation, fuel, restroom etc. to be provided to the labour force during construction as well as to the casual workers including truck drivers during operation phase.	**Kindly refer to page no. 10.1 to 10.2 of Chapter-10 of Final EIA report.**
11.	Enterprise Social Commitment (ESC)	
	i. Adequate funds (at least 2.5 % of the project cost) shall be earmarked towards the Enterprise Social Commitment based on Public Hearing issues and item-wise details along with time bound action plan shall be included. Socio-economic development activities need	**Kindly refer to page no. 8.1 & 8.2 of Chapter-8 of Final EIA report.**

TOR No.	TOR Point	TOR Compliance
	to be elaborated upon.	
12.	Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.	**No litigation is pending against the project and/or any direction/order passed by any Court of Law against the plant.**
13.	'A tabular chart with index for point wise compliance of above TOR.	**Noted and Complied.**
14.	The TORs prescribed shall be valid for a period of three years for submission of the EIA – EMP reports.	**Noted.**

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CHAPTER – 1
INTRODUCTION

1.1. PURPOSE OF THE REPORT

Environmental Impact Assessment (EIA) is systematic process to identifying, predicting, evaluating and mitigating the biophysical, social and other relevant environmental effects due to the proposed developmental project. It plays a vital role in providing information for decision-making on the environmental consequences of project. It promotes environmentally sound and sustainable development through the identification appropriate enhancement and mitigation measures.

It is the responsibility of the company to document the associated positive and negative impacts, so that the attempts can be made to minimize the effects due to the negative impacts and maximize the benefits due to the positive impacts. In this regards, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) have been considered as the most important documentation in understanding the environmental implications and safeguarding the environment.

1.2. IDENTIFICATION OF PROJECT & PROJECT PROPONENT

Rapid industrialization leads to all-round development and improvement in quality of people in the area. Andhra Pradesh is a very congenial state for industrial growth due to availability of manpower, raw materials and other infrastructural facilities.

About the Project:

M/s. Crux Biotech India Private Limited is operating grain based distillery plant of 60 KLPD capacity & 2.5 MW power plant in Sy.Nos.529p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh. The existing plant is having a valid Consent to Operate (CTO) from A.P. Pollution Control Board.

M/s. Crux Biotech India Private Limited has now proposed to enhance the distillery plant capacity from 60 KLPD to 75 KLPD capacity with process modifications without installing any additional machinery in the same existing plant premises comprising of in Sy.Nos.529 p, 530, 531p, 532p,

536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh.

As per the Ministry of Environment, Forests & Climate Change, New Delhi Notification, dated 14th September, 2006 and its subsequent amendments, Grain based Distillery plants with capacity more than 60 KLPD are classified under Category 'A'. In order to obtain Environmental Clearance for the proposed expansion of Distillery plant, Form - I, proposed TOR along with Pre-Feasibility Report have been submitted to the Ministry of Environment, Forest & Climate Change (MoEF&CC), New Delhi. A presentation has been made before the Expert Appraisal Committee of MOEF&CC on 26th December, 2016 for the approval of TOR for EIA study. Accordingly TOR letter has been issued vide F.No. J-11011/359/2016- IA II (I) dated 28th February, 2017. The Final EIA report has been prepared in accordance with the TOR issued by the Hon'ble Ministry.

Pioneer Enviro Laboratories & Consultants Private Limited, Hyderabad, which is accredited by NABET, Quality Council of India for conducting EIA studies for Distillery plants, have prepared Environmental Impact Assessment (EIA) report for the proposed capacity enhancement.

This report furnishes the details of location of Site, Description of the project, prevailing baseline status w.r.t Air Environment, Water Environment, Noise Environment, Land Environment, Flora & Fauna and Socio-economic environment. This report also helps in identification of environmental impacts and suggesting mitigation measures to be followed during Construction and Operation of the project as part of Environmental Management Plan. This report also acts as guidance manual for the proponent for following the Environmental Management Plan (EMP) and for adopting post project Environmental Monitoring Program as per statutory norms.

About Project Proponent: **[GENERIC TOR # 2 ii]**

The Promoters

The proposed expansion project of the Ethanol Plant would be undertaken & implemented by the management of '**Crux Biotech India Private Limited**. The promoters are experienced in operating the existing 60 KLPD unit & have made a thorough study of entire project, planning as well as implementation schedule. The names and designations of the Promoters are as under:

S.NO	NAME	DESIGNATIONS
1.	Sri. G. Ravi chandran	Director
2.	Sri. G. Chandra Sekhar Reddy	Director
3.	Sri. M. Subba Reddy	Director

1.3. BRIEF DESCRIPTION

1.3.1. NATURE OF THE PROJECT

Presently existing 60 KLPD grain based distillery is producing Rectified Spirit / ENA / Ethanol. Now it has been proposed to enhance the distillery plant production capacity from 60 to 75 KLPD with process modifications without installing any additional machinery.

1.3.2. SIZE OF THE PROJECT [GENERIC TOR # 3 iii]

Following table shows the existing products, production capacities, Expansion capacities and after expansion capacities.

S. NO.	Unit	PRODUCT / BY PRODUCT	EXISTING CAPACITY	EXPANSION CAPACITY	AFTER EXPANSION CAPACITY
1.	Distillery (with Grains)	Rectified Spirit/ENA/Ethanol	60 KLPD	15 KLPD	75 KLPD
2.	Power	Electricity	2.5 MW	---	2.5 MW
3.	$C0_2$ recovery plant	$C0_2$ (By product)	45.6 TPD	9.6 TPD	55.2 TPD

1.3.3. LOCATION OF THE PROJECT

M/s. **Crux Biotech India Private Limited** was obtained Environmental clearance for 60 KLPD Grain based distillery and 2.5 MW power plant in Sy.Nos.529 p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh from MOEF&CC, New Delhi vide letter No. F.No.J.11011/579/2010-IA II (I) dated 16/10/2012. Now it has been proposed to enhance the Distillery plant capacity from 60 KPLD to 75 KLPD with process modifications without installing any additional machinery. The existing plant is having land of 28.98 acres. There is no additional land involved in the proposed expansion project.

1.3.4. IMPORTANCE OF PROJECT: [GENERIC TOR # 2 iii]

The distillery industry today consists broadly of two parts, one potable liquor and the industrial alcohol including anhydrous ethanol for blending with petrol. The potable industry producing Indian Made Foreign Liquor and Country Liquor has a steady but limited demand with a growth rate of about 7-10 per cent per annum. The industrial alcohol industry on the other hand, is showing a declining trend because of high price of Molasses which is invariably used as a substrate for production of alcohol. The alcohol produced is now being utilized in the ratio of approximately 52 per cent for potable and the balance 48 percent for industrial and ethanol for blending with petrol, use. Over the years the potable liquor industry has shown remarkable results in the production of high quality spirits. Indian Liquor industry is today exporting a sizable quantity of Indian Liquor products to other countries.

The utilization of Ethyl alcohol or Ethanol, now popularly known as alcohol, for industrial use is a recent phenomenon and its importance came into being towards the end of the second world war. With protection being granted to the sugar Industry in 1932, a large number of sugar factories were established in the country, particularly in Maharashtra and Uttar Pradesh where irrigation facilities existed for cultivation of sugarcane. This increase resulted in accumulation of molasses, which resultantly, caused unmanageable environmental problems. At that time the demand for molasses was almost insignificant and the sugar mills had to incur some expenditure on removal of this bye product i.e. molasses. For resolving these problems a joint committee of U.P. and Bihar was constituted to explore the possibilities of developing alcohol based industries for the purpose of utilization of molasses. The Committee in its report recommended the establishment of distilleries for production of alcohol, utilizing molasses as substrate.

It also recommended that alcohol produced by the distilleries should be admixed with petrol, to supplement motor fuel. The production of alcohol did not only help in solving the problems of disposal of molasses but it also filled up the gap in the demand and supply of motor spirit. As a substantial quantity of alcohol after meeting its requirement for manufacture of gasohol alcohol was diverted for production of alcohol based chemicals in different parts of the country. The utilization of alcohol for this purpose progressed steadily and a substantial quantity of alcohol produced in the country is now being utilized for manufacture of solvents and intermediates. Till a few years back a little more than 50% alcohol produced in the country was being utilized for

production of alcohol based chemicals but after the decontrol of molasses in the year 1993 the utilization of alcohol for production of chemicals, dye-stuff, synthetic rubber, polymers and plastics etc. has received a setback.

However, with the advent of ethanol blending with petrol / motor fuel, the requirement of ethanol/ industrial alcohol has increased manifold in the country to the extent that in case 5-10 % blending, if made mandatory all over the country, the sugar factory molasses available in the country shall not prove to be adequate for meeting the total requirement of ethanol including its use for potable liquors and other industrial uses. The alcohol industry has a total installed capacity of 4200 million litres of alcohol in a year. However, the licenced capacity is concentrated in three states of U.P., Maharashtra and Tamilnadu. With the announcement of the Government of India to make blending of motor fuel with ethanol upto 5 % mandatory and to raise it to 10% by the year 2017-18, a substantial increase in the requirement as well as production capacity of ethanol is expected and a large number of ethanol distilleries are on the anvil of installation.

The ethanol is being mixed with petrol upto 20% to 25 % in Brazil and nearly 30 -40 % in USA particularly in the state of California. India therefore has to immediately look for other sources of feedstock for production of ethanol for increasing the total production and meeting the requirement of ethanol even for 5-10% blending with petrol, coupled with further increasing the availability of molasses through increase in sugar cane production and sugar mills capacity. Thus the distillery industry is destined to play a very important and vital role in the nation's economic and industrial scenario in the near future.

1.4. SCOPE OF THE STUDY

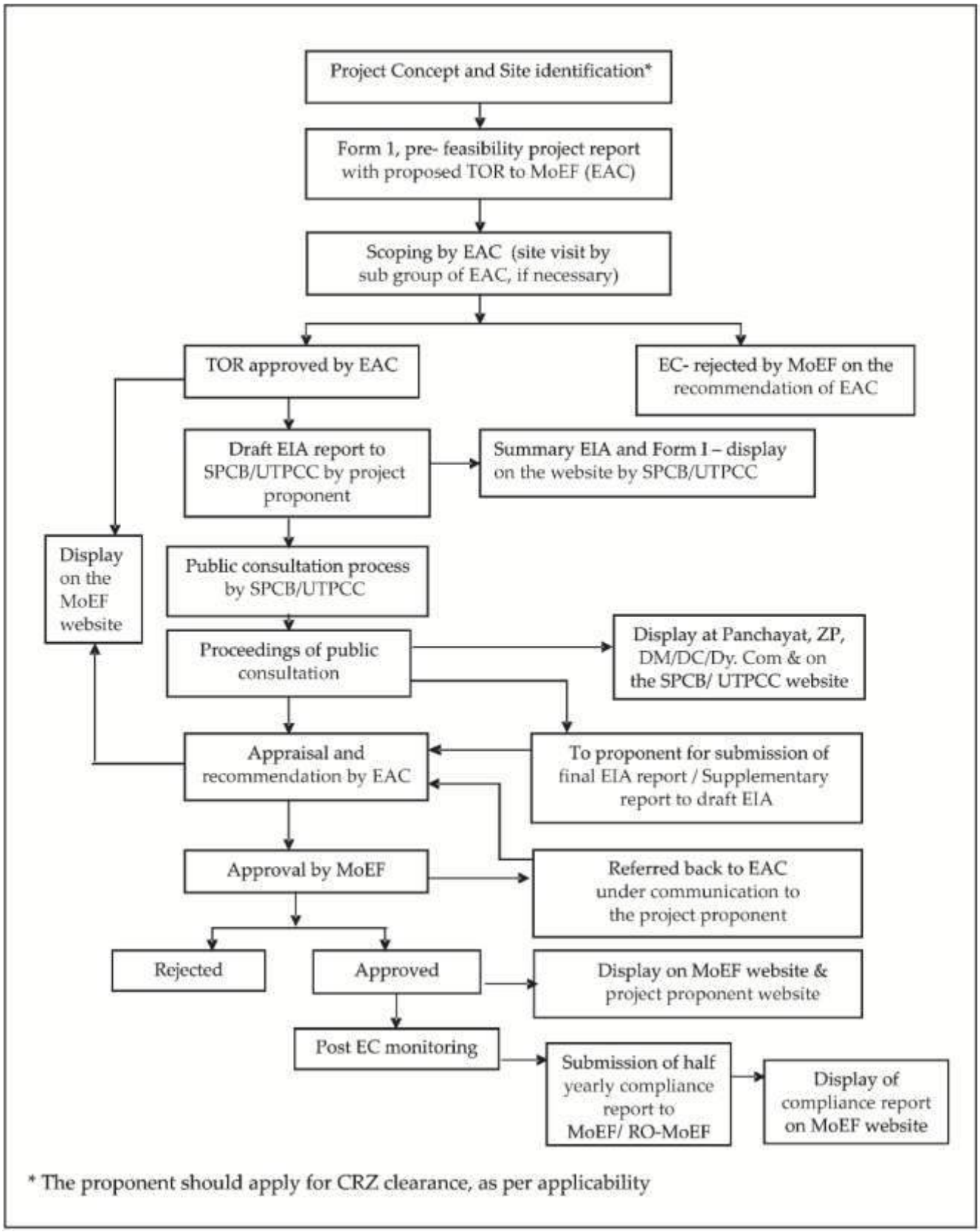
The scope of work includes a detailed characterization of the environment in an area of 10 Km. radius of the plant site for various environmental parameters like Air, Water, Noise, Land, Biological and Social-economic aspects. Public Hearing for the proposed capacity enhancement has been exempted by MOEF&CC.

The Final EIA Report is prepared in accordance with the Terms of Reference issued by the Ministry of Environment, Forests & Climate Change, New Delhi.

Generic Structure of the Environmental Impact Assessment (EIA) report as per the EIA notification of the MoEF&CC, GoI dated 14th September 2006 and its subsequent amendments is detailed below:

Ch. No.	Heading
1.	Introduction
2.	Project Description
3.	Description of the Environment
4.	Anticipated Environmental Impact & Mitigation Measures
5.	Analysis of Alternatives (Technology & Site)
6.	Environmental Monitoring Program
7.	Additional Studies
8.	Project Benefits
9.	Environmental Cost – Benefit Analysis
10.	Environmental Management Plan (EMP)
11.	Summary & Conclusion
12.	Disclosure of consultant engaged

1.5. ENVIRONMENTAL CLEARANCE PROCESS



CHAPTER – 2
PROJECT DESCRIPTION

2.1 TYPE OF PROJECT

The proposed expansion project involves capacity enhancement of grain based distillery from 60 to 75 KLPD with process modifications without installing any additional machinery in existing plant. The products are same as existing plant i.e. Rectified Spirit / ENA / Ethanol by using Grains as raw material.

2.2 NEED FOR THE PROJECT

There is much scope in Andhra Pradesh to procure raw materials other than Molasses for manufacture of portable spirit in distilleries. There is abundant availability of Maize, Jowar, Bajra, Broken rice, damaged rice and cereals. In the year 1986 few thousands of tones of rice was damaged due to cyclone in Andhra Pradesh rendering unfit for human consumption and cattle feed, and were sold to distilleries at the rate of Rs.300 per tonne. The sprouted material and low quality, grain comes to 8% of annual production in India. The best way of utilization of these valuable carbohydrates is to convert them into best quality of alcohol suitable to manufacture of high quality liquor.

In Andhra Pradesh, the former will get reasonable and better price and constant assurance income and will be demand for the grains such Maize, Jowar, Bajra, Broken rice etc.. The quality of liquor manufactured out of grain based alcohol is much superior than Molasses based alcohol and harmless to health.

Due to availability raw material and latest technology, Crux Biotech India Private Limited has proposed to increase it distillery plant capacity from 60 KLPD to 75 KLPD in the existing plant premises.

2.3 LOCATION OF THE PROJECT SITE: [GENERIC TOR # 4 iv]

Crux Biotech India Private Limited is operating with 60 KLPD Grain based distillery and 2.5 MW power plant in Sy.Nos.529p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh, the existing plant is having land of 28.98

acres. The following are the coordinates of the plant site

TABLE 2.3.1

COORDINATES OF PLANT SITE

S. NO.	LATITUDE	LONGITUDE
1.	16° 45' 58.47" N	80° 08' 52.43" E
2.	16° 45' 57.25" N	80° 09' 04.14" E
3.	16° 45' 50.53" N	80° 09' 04.95" E
4.	16° 45' 48.08" N	80° 09' 03.64" E
5.	16° 45' 45.21" N	80° 09' 11.26" E
6.	16° 45' 43.90" N	80° 09' 03.81" E
7.	16° 45' 41.69" N	80° 09' 02.42" E
8.	16° 45' 44.47" N	80° 08' 54.15" E
9.	16° 45' 46.27" N	80° 08' 50.63" E
10.	16° 45' 49.88" N	80° 08' 53.74" E
11.	16° 45' 53.48" N	80° 08' 51.77" E
12.	16° 45' 55.53" N	80° 08' 53.66" E

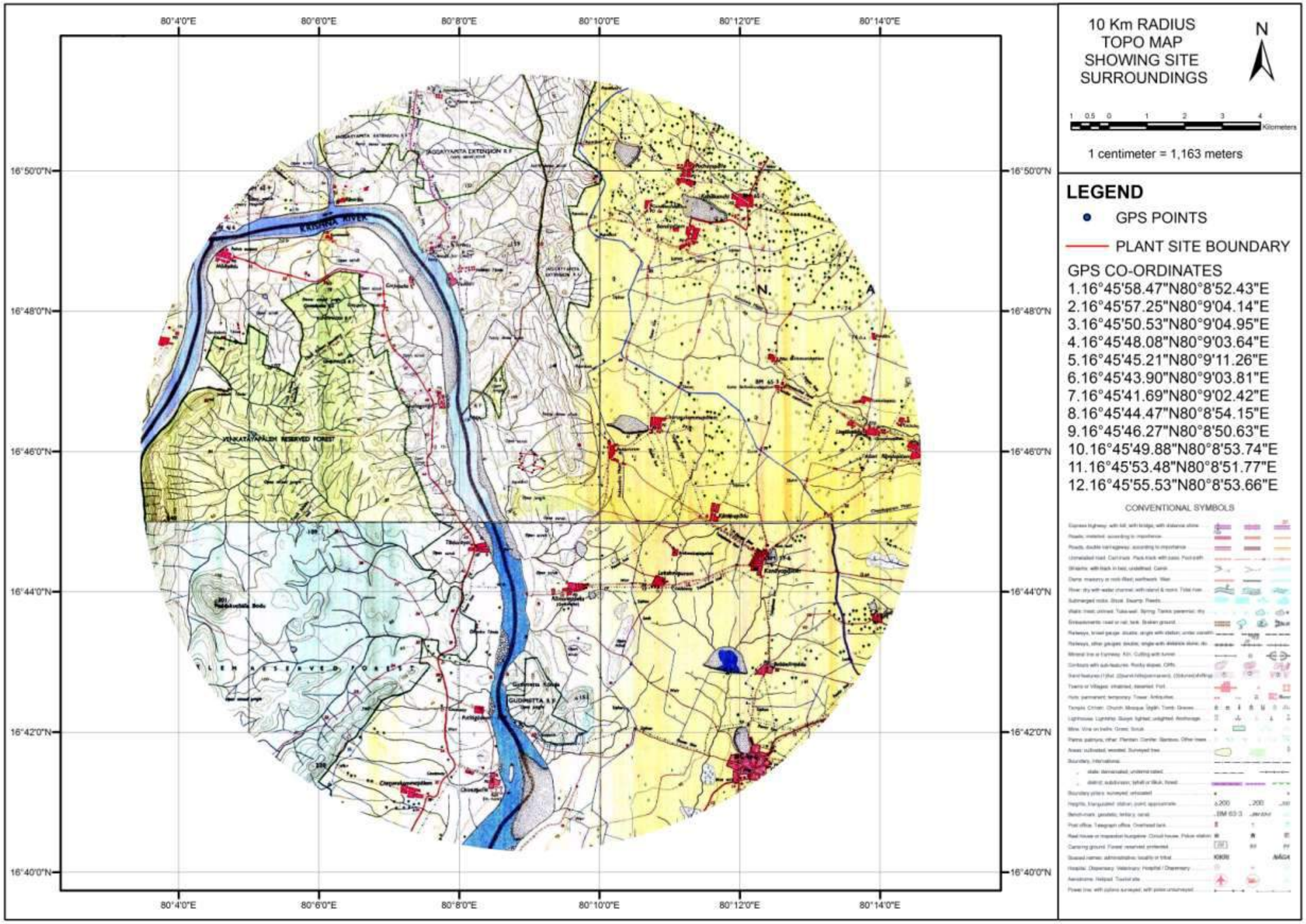
Now it has been proposed to enhance Distillery plant from 60 KPLD to 75 KLPD with process modifications without installing any additional machinery in existing the plant. There is no additional land envisaged for the proposed capacity enhancement.

Map showing General Location, Topographical map showing 10 KM. radius and Google map showing existing plant site and photographs of the existing plant site of is shown as Figure No. 2.1, 2.2, 2.3 & 2.4.

Crux Biotech India Private Limited

GENERAL LOCATION OF PLANT

FIGURE; 2.1



PLANT SITE -TOPO GRAPHICAL MAP OF 10 KM RADIUS

FIGURE: 2.2

[GENERIC TOR # 4 ii]

GOOGLE MAP SHOWING PLANT SITE

Map not to scale

FIGURE; 2.3

[GENERIC TOR # 4 v]

PHOTOGRAPHS SHOWING EXISTING PLANT AND GREENBELT DEVELOPED

FIGURE: 2.4

[GENERIC TOR # 4vii]

2.3.1 ENVIRONMENTAL SETTING WITHIN 10 Km. RADIUS OF THE PLANT SITE

The Salient Features/Environmental features with in 10 Km. radius of the plant site are as following.

Salient Features / Environmental features	Distance w.r.t. site / Remarks
Present land use	Industrial Land.
Type of Land (Study Area)	As per LULC the land use within 10 Km. is as follows: Settlements – 5.1 %; Industrial Area-1.3 %; Water Bodies – 11.2 %; Scrub Forest area – 18.1 %; Single crop land –27.1 %; Double Crop Land – 17.4 %; Plantation Area – 1.9 %; Land with scrub – 7.1 %; Land without scrub – 6.5 %; Sheet Rock are-1.5 % & Mining area –1.8 %.
National Park/ Wild life sanctuary / Biosphere reserve / Tiger Reserve / Elephant Corridor / migratory routes for Birds	Nil
Historical places / Places of Tourist importance / Archeological sites	Nil
Industrial areas / cluster (MoEF&CC office memorandum dated 13th January 2010)	Nil
Defence Installations	Nil
Nearest village	Peddavaram village – 1.6 Kms.
Reserved forests	The following reserve forests are situated with in 10 Km. radius from the plant site. A) Venkataya Palem RF _ 2.3 Kms. B) Jaggayyapeta RF – 2.4 Kms. C) Gudimetla RF – 4.1 Kms. D) Gingupalle RF- 4.1 Kms. E) Kuntimaddi RF – 5.0 Kms
Water bodies	Krishna River – 1.3 Kms. Nagarjuna Sagar Left Bank Canal- 3.4 Kms. Few ponds exists with in 10 Km. Radius
List of Industries / Mining activity **[GENERIC TOR # 4 ix]**	M/s. Sudheer Bio products Pvt. Ltd. (60 KLPD Grain based distillery) – No work initiated. M/s. Vasista Fermentation Private Limited (80 KLPD Distillery) - No work initiated and even EC validity also lapsed. Krishna district has lot of potential for grains and grain availability for the proposed project and for the aforementioned plant will not be a problem.
Crops in the Study Area	Major Crops - Paddy, Maize, Sugar cane, Pulses

Salient Features / Environmental features	Distance w.r.t. site / Remarks
	Commercial crops – Cotton, Tobacco, etc. Horticulture crops – Lemons, Papaya, Banana, Potato, Mango, Tomato etc.
Nearest Railway Station	Nil
Nearest Port facility	Nil
Nearest Airport	Nil
Nearest Interstate Boundary	Telangana State boundary is situated at a distance of 8.9 Kms. from the plant.
Seismic zone as per IS-1893	Seismic zone – III
R & R	There is no rehabilitation and resettlement issue, the proposed expansion will be taken up in the existing plant premises.
Any litigation pending against the project and / or any direction / order passed by any court of law against the project.	No litigation pending against the project and / or any direction / order passed by any court of law against the plant.

2.4 DETAILS OF LAND: [GENERIC TOR # 4 viii & xii]

Proposed enhancement of Distillery plant from 60 KLPD to 75 KLPD will be taken up in 28.98 acres of land, for which Environmental Clearance has already been obtained. The Survey Numbers of total land are of 529p, 530, 531p, 532p, 536p, 557p, 560p & 564p and the same is available with management.

TYPE OF LAND

Total land available for the existing plant is 28.98 Acres and same is available with management. The proposed expansion will be taken up in the existing plant premises.

LANDUSE

S.NO.	ITEM	AREA IN ACRES
1.	Private Land	28.98
2.	Govt. Land	NIL
3.	Forest Land	NIL
	Total land	**28.98**

LAND USE-STATEMENT

S.No.	ITEM	EXTENT OF LAND (ACRES)
1.	Built-up area of the plant	6.0
2.	Internal roads	2.5
3.	Storage area	3.0
4.	ETP	3.0
5.	Greenbelt	9.0

6.	Parking Area	2.0
7.	Miscellaneous facilities	3.48
	Total Land	**28.98**

2.5 SIZE / MAGNITUDE OF OPERATION [GENERIC TOR # 3 ii]

Crux Biotech India Limited has proposed to increase it distillery plant capacity from 60 KLPD to 75 KLPD in the existing plant premises. Following is the plant configuration and production capacity.

S. NO.	PLANT	PRODUCT/ BY PRODUCT	EXISTING	EXPANSION	AFTER EXPANSION
1.	Distillery (with Grains)	Rectified Spirit/ENA/Ethanol	60 KLPD	15 KLPD	75 KLPD
2.	Power	Electricity	2.5 MW	---	2.5 MW
3.	$C0_2$ recovery plant	$C0_2$(By product)	45.6 TPD	9.6 TPD	55.2 TPD

The plant will be operated for a maximum of 330 days in a year.

2.6 PROJECT COST [GENERIC TOR # 3i]

Since the proposal is for Enhancement of distillery plant production capacity from 60 KLPD to 75 KLPD with process modifications without installing additional machinery, no additional cost for the expansion project is envisaged.

2.7 PROPOSED SCHEDULE FOR APPROVAL AND IMPLEMENTATION

The expansion project will be implemented within 6 months from the date of issue of Environmental Clearance by the Ministry of Environment, Forest & Climate Change & Consent For Establishment by APPCB.

2.8 TECHNOLOGY AND PROCESS DESCRIPTION

2.8.1 RAW MATERIALS ITS SOURCES [GENERIC TOR # 3 iv]

The following will be the raw material requirement for the existing and proposed expansion plant.

S.NO	RAW MATERIAL	SOURCE	EXISTING	EXPANSION	AFTER EXPANSION	METHOD OF TRANSPORT
1.	Grains (Maize, corn, Sorghum grain, broken rice and other starch based grains, etc.)	Local area	160TPD	40 TPD	200 TPD	Through covered trucks by Road
	Fuel for existing 25 TPH Boiler					
1	Imported coal	Indonesia /Austria	70 TPD	--	70TPD	Through Sea/Rail/ Road
	(or)					
2	Indian Coal	SSCL	115 TPD	--	115 TPD	Through covered trucks by Road
	(or)					
3	Biomass	Local	135 TPD	--	135 TPD	Through covered trucks by Road

2.8.2 RAW MATERIAL STORAGE & HANDLING

The Capacity of the existing Silo is 2700 MT in which Grains such as Broken rice, maize, bajra, jowar are being stored and other starch containing grains etc. are being stored in gunny bags in covered storage godowns. Even after expansion there will not be any increase in capacity of silos, godowns and only inventory will be reduced.

2.8.3 TRANSPORT OF RAW MATERIALS

Main raw material grains are locally available and will be transported by covered trucks by road to the plant. The existing roads are capable of absorbing the additional traffic. Hence there will not be any adverse impact on environment due to vehicular movement.

2.8.4 GRAIN AVAILABILITY

The main raw material required is grains which are available in plenty. The main raw materials that can be used in the manufacture of Extra Neutral Alcohol (ENA) are Maize, broken rice and Jawar. Andhra Pradesh is one of the largest producers of Maize in the country followed by Northern States. The other raw material required is broken rice which is also abundantly produced in Andhra Pradesh. Jawar, another raw material that can be used in the production of Extra Neutral alcohol (ENA) is also available abundance in this region.

2.8.5 MANUFACTURING PROCESS [GENERIC TOR # 3 viii]

2.8.5.1 DISTILLERY

Process Modifications proposed

The following process modification is proposed to enhance the distillery plant capacity from 60 to 75 KLPD.

- Currently we are maintaining certain flour: water ratio to get 30% solid in liquefaction for achieving 10-11% Alcohol. We shall increase the flour rate while keeping the same quantity of water in flour: water ratio in the liquefaction process to get higher solid i.e. 33-35% for achieving 13-15% Alcohol in fermenter. This will increase ENA production up to 75KLPD from 60KLPD without additional consumption of water.

Grain Handling

The incoming corn grains are inspected upon receipt. Inspection is carried out to determine the bushel weight, moisture content, mold infestation and general appearance. The accepted quality corn grain is unloaded into silos for general appearance the accepted quality corn grain is unloaded into silos for storage before milling .The stored grain is weighed to determine the incoming quantity. Grain is lifted and unloaded by bucket elevator into grain silos. Grain from hopper is transferred continuously to feed bin of intermediate bucket elevator. This bucket elevator lifts the grains and feeds to vibratory pre-cleaner.

The Pre-cleaner removes light impurities like Straws, Stem and fine dust. Grain from vibrator will be fed by gravity to magnetic separator to remove iron particles. From magnetic separator the grain

will be fed by gravity to de-stoner. This machine removes heavier particles like stones and supplies almost stone free grains. From de-stoner the grain will be fed by gravity to hammer mill.

Grains will be stored in silos only.

Milling Section

Milling is required to reduce the particle size of raw material. The milling section of the plant has the necessary equipments for cleaning of raw materials and screening the final floor so as to get the desired particle size.

The raw material is first milled to form floor in the milling section. The lower particle size increases the total surface area per unit weight and helps during slurry preparation. The slurry of the milled raw material is prepared in water and this slurry is then sent for liquefaction. In this mill 20 to 30 % oversize particles will be recycled for second milling. The milling also will be provided with proper destoner and magnetic separators.

LIQUIFICATION SECTION

Liquefaction initiates the conversion of starch into simple molecules of dextrin. It is divided into three sub processes.

A.PRE LIQUEFACTION : This involves partial liquefaction of starch**,** in presence of enzyme**,** at a temperature well below the gelatinization temperature**.**

B.JET COOKING :

- In the existing plant Jet- cooker is being used for cooking of flours.
- When Flours are cooked at high temperature, some quantity of starch burns and is not converting into alcohol and results in yield losses.
- But new generation advance enzymes are modified to work on raw starch instead of Jet cooking.
- **No-Jet cooking** helps to save starch which was burning during Jet cooking due to high temperature.
- This saved starch will convert into alcohol and increase the conversion efficiency, yield and alcohol production with same effluent output.

C. POST LIQUEFACTION: The jet cooked slurry is again held at high temperature in presence of enzyme to complete the process of liquefaction**.**

SACCHARIFICATION:

Saccharification is the formation of sugars. Here, it is done enzymatically by breakdown of dextrin. Here the dextrin is acted upon by a second enzyme for further breakdown and release of sugars.

FERMENTATION:

The batch fermentation proposed is the latest and proven technology as compared to the old Continuous fermentation technology. It has many advantages like continuity of operation, higher efficiency and ease of operation. Considering all the above advantages, we have proposed to adopt the efficient fermentation in the distillery.

The yeast is immobilized using special media and it remains in the fermentation plant throughout and hence it gives a tremendous advantage in maintaining the yeast population and in combating the bacterial infection.

Saccharified slurry from Saccharification section is pumped into Fermenter. It is, then inoculated with required quantity of suitable yeast. The assailable nitrogen is added in the medium in the form of urea and dap. Temperature in the Fermenter is maintained with the help of plate heat exchanger.

- With the presently used enzymes, some quantity of starch was not converted into Dextrose.
- Now we propose to use new generation advance enzymes such as **1. Saczyme-Pro, 2. Novozym-25044** which improves conversion efficiency of starch i.e. maximum starch will convert into Dextrose which inturn will easily convert into alcohol.
- This improvement of conversion efficiency helps us to increase the yield (alcohol production / MT of grain) and production with same effluent output.

The fermented mash is recirculated continuously through PHE. Recirculation also helps in proper mixing of fermented mash. The rate of fermentation reaction gradually increases and after 50 to 55 hours, fermentation completes. After completion of reaction the fermented mash is delivered to mash holding tank. The fermented mash collected in the Clarified Wash Tank is then pumped to Mash or Primary column for distillation.

A closed loop cooling tower system with an induced draft-cooling tower with circulation pumps is also provided to ensure higher cooling efficiency and to minimize water wastages.

ADVANTAGES OF FERMENTATION PROCESS

1. **Starch Fermentation Process**

- Good ease of operation and easy way daily cleaning / filling required.
- Consistency in plant operation and performance is very high.
- Less operating manpower required.
- The process can also be automated with less cost and great ease.
- Easy to control & trouble shoot, as it is a continuous process.

2. **Culture Yeast usage**

- Genetically modified yeasts have been developed which can tolerate the high alcohol%, DS and temperature.
- This Yeast will convert maximum sugar into production of alcohol and fermentation efficiency will increase, which in inturn will help to increase Yield and alcohol production with same effluent output.
- So without changing the effluent output, we will increase alcohol production by increasing DS, conversion efficiency of grain's starch and Fermentation efficiency using Genetically modified Yeasts and Enzymes.

3. **Higher Alcohol Concentration in Wash:**

- Less effluent volume and low cost of treatment.
- Reduced steam consumption in Distillation.
- Higher alcohol concentration ensures low bacterial activity in fermentor.
- By increasing DS (Dissolve solids), alcohol % can be increased in fermenters from 8 to 11% which results in enhanced production without any changes in effluent output

4. **Rugged Process based on culture Yeast Technology:**

- Can handle varying quality raw material.
- Easy to start and stop, as and when required.
- Can take care of fluctuations like temperature and other conditions.
- Good control and handling of bacterial contamination.

5. **Higher alcohol recovery per MT of Grain**

6. **Yeast can withstand a temperature of up to 34 deg C:** The process works at different climatic conditions i.e. at different locations and also in hot seasons without significant drop in performance.
7. **Lesser residence time of fermentation:**

- Lower residence time also help to maintain low bacterial activity.
- Lesser fermentor volumes and lower capital cost.

8. **Agitation is required in fermentors:**

- Low electricity consumption.

9. **Minimum and controlled air sparing is employed for fermenter:**

- Low electricity consumption.

B) MULTIPRESSURE DISTILLATION

The vacuum distillation has many advantages over conventional distillation atmospheric distillation plants like lower energy requirement, very good quality alcohol and less scaling of the distillation trays due to sludge. The **Multipressure Distillation** produces ethanol of international quality standards and there is a lot of demand of ethanol from the vacuum distillation process.

"The Extra Neutral Alcohol produced from this latest technology will meet most of the international quality standards for ethanol like US Pharmacopoeia, British Pharmacopoeia and Japanese standards." The **Multipressure Distillation** approximately requires 50 % less steam as compared with the conventional old distillation technologies. The **Multipressure Distillation** consists of distillation columns with high efficiency column trays, condensers, re-boilers, vacuum pumps and reflux pumps. A closed loop cooling tower system with an induced draft-cooling tower with circulation pumps is also provided to ensure higher cooling efficiency and to minimize water wastages.

In this **Multipressure Distillation** ethanol is separated and concentrated using principal of fractional distillation. This is based on difference in boiling points of volatile compounds in mixture. There are

six columns in the system Primary column also called Mash column, Rectifier column, Hydro extractive distillation column, Refining column, Dealdehyde Column and Defusel Column

The Primary or Mash column is operated under vacuum and it is heated using the vapours from the Rectifier column, which is operated under a slightly higher pressure. The vacuum operation of the Primary column will help in reducing the overall energy requirement and also improve the product quality.

Due to vacuum operation of the Primary column the scaling of the column trays is minimised and plant can be operated without stoppage for a longer duration as compared with atmospheric plant.

The fermented mash is preheated using a beer heater at the top of the Primary column and followed by a plate heat exchanger and finally delivered to the top of Primary column. The pre heating of mash in two stages recovers energy and saves steam required for the distillation. The mash runs down the Primary column trays from tray to tray, while vapour goes up in the column contacting the mash at each tray. As a result of this contact and boiling, ethanol and other impurities along with some water are stripped in the form of vapours and remaining mash in the form of vinasse (effluent) is disposed off from the bottom of the Primary column for ETP.

When the vapours of ethanol and other volatile compounds reach the top, they are separated out from the top of Primary column and are then condensed in beer heater and other Primary condensers. The heat is supplied by the Rectifier vapours from the Reboilers provided at the bottom of the Primary column.

Two reboilers are provided at the bottom of the Primary column to facilitate the heat transfer from Rectifier column vapour to Primary column. The vapours from Primary top condensed in the above condensers are collected and fed to the Hydro extractive distillation column for purification. The ethanol streams from other columns are also diluted with soft water and are fed to Hydro extractive distillation column via a feed preheater (plate heat exchanger). A Reboiler is installed at the bottom of the Hydro extractive distillation column. Impurities such as Aldehydes and Fusel oil are removed from the top of the Hydro extractive distillation column and are fed to Fusel oil concentration column, while dilute ethanol along with fewer impurities, are taken from the bottom

of the Hydro extractive distillation column and fed to Rectifier column middle. Steam is fed to Hydro extractive distillation column through Reboiler.

A Reboiler is installed at the bottom of the Rectifier column, which heats the process liquid i.e. alcohol and water received from the Hydro extractive distillation column, indirectly with the help of steam. In the Rectifier column, the ethanol is concentrated to 96 % by refluxing the Rectifier reflux liquid. Extra neutral ethanol alcohol is tapped from the top of Rectifier column, which is directly sent to Refining column for removal of other low boiling impurities. While the bottom product of the Rectifier column called spent lees is drained off. The higher alcohols also called light and heavy fusel oils are removed from the middle portion of the Rectifier column so that they are mixed with Extra Neutral Alcohol.

Light and Heavy fusel oil from Rectifier column and top cut from Hydro extractive distillation column plus ester cut from Hydro extractive distillation column is fed to Fusel oil concentration column.

The steam is delivered from the bottom of the Defusel Column to allow the desired separation. Fusel oil consisting of higher alcohols viz. amyl alcohol, iso amyl alcohol, n-propenol etc. are concentrated near middle portion of Fusel oil concentration column and can be removed and separated in the Fusel Oil Decanter in sufficient higher concentration. While the bottom product called spent lees is drained off.

The top product from the Defusel Column is cooled in the cooler and sent to storage as Technical Alcohol. The Refining column is fed with the ENA from the Rectifier column, which is boiled off in the Refining column to remove the low boiling impurities like methanol and mercaptants.
Extra Neutral Alcohol (ENA) is tapped from the bottom of the Refining column, which is cooled upto 30 ^{0}C, by passing through ENA cooler.

The impure ethanol, which contains many impurities, is drawn from the top of the Refining column and cooled in the cooler and sent to storage as Technical Alcohol. Alternatively diluting with soft water in Dealdehyde Column as and when required can further purify some of these Technical Alcohol streams.

Both fermentation and distillation are operated with PLC computer controls system. This will help in maintaining the parameters consistent and without any fluctuations. Most modern distillery plants use computer system for controlling their parameters.

Advantages of Distillation Process

1. **Vacuum Multipressure Distillation:**

- Multipressure operation results in to good overall energy savings over a longer period.
- Vacuum operation (low temperature) of Mash column ensures minimum scale formation of the trays / other column internals and hence very low cleaning frequency of Mash column is required.
- Lower temperature operation also ensures good quality alcohol, due to less pyrolysis impurity formation in Mash column.
- Much better stripping (separation) of low boiling impurities takes place under vacuum conditions.

2. **Simple ENA distillation scheme:**

- The distillation scheme consists of optimum number of distillation columns and their configurations, allowing lower capital cost.
- The scheme of distillation is very simple and allows easy operation.
- The simple distillation scheme allows for a cost effective level of automation using PLC system.
- The overall electricity requirement is also low, as compared to other complicated atmoshperic distillations.

3. **Effective separation of Impurities and alcohol quality:**

- Better quality ENA, as both low boiling and higher boiling impurities are separated effectively in dedicated columns.
- Vacuum conditions also help in separation of many impurities.
- The alcohol produced is of Neutral taste and character, with a Potassium Permanganate Test Time of around 30 to 35 minutes as BP 1993 method.

- The number of trays and tray spacing in each column are designed, for handling different quality fermented wash.
- The same distillation scheme can be easily made flexible to produce different quality products depending on the requirement.

4. Higher Distillation efficiencies:

- The distillation trays are of Bubble Cap construction, designed using vast experience, resulting in to good tray efficiencies at varying conditions.
- The turndown of the distillation plant is as high as 40 to 50 %, which allows the operation at 40 to 50 % capacity, without any significant change in the efficiency and steam consumption.
- Mash column losses are quite low due to, less scaling, at lower temperature operation.
- The alcohol vapors, after vacuum system is scrubbed to recover maximum alcohol.

5. Instrument System using DCS (Distributed Control System)

- PLC system is a most cost effective instrumentation system for distilling industry.
- It results in to a very high consistency level in terms of alcohol quality, distillation efficiency and energy consumption.
- The distillation operation requires less manpower.
- The DCS system allows easily, changing the operating parameters to produce different quality alcohol as and when required.

MOLECULAR SEIEVE TECHNOLOGY FOR ETHANOL

Molecular sieve technology works on the principle of pressure swing adsorption. Here water is removed by adsorbing on surface of `molecular sieves' and then cyclically removing it under different conditions (steaming).

Molecular sieves are nothing but synthetic zeolites typically 3A zeolite. Zeolites are synthetic crystalline Alumino Silicates. This material has strong affinity for water. They adsorb water in cold condition and desorb water when heated. This principle is used to dehydrate ethanol. The crystalline structure of zeolites is complex and gives this material the ability to adsorb or reject material based on molecular sizes. Water molecule can enter the sieve and be adsorbed, but larger

alcohol molecule will not be retained and will go through the bed. There can be two to three beds in parallel. Once a particular bed is saturated with water, it is heated with steam so that adsorbed water is desorbed from the bed. Till that time, other bed is used for dehydration.

This type of system is characterized by high capital investment. Low steam consumption and low power consumption as compared to distillation. The only disadvantage of molecular sieves is the high attrition rates of sieves in case of small plants. Hence, typically, some amount of sieve material needs replacement periodically, thereby resulting in higher cost of production in case of small capacity plants. in case of large capacity plants, the molecular sieve is the most optimum both in terms of initial investment and operating cost.

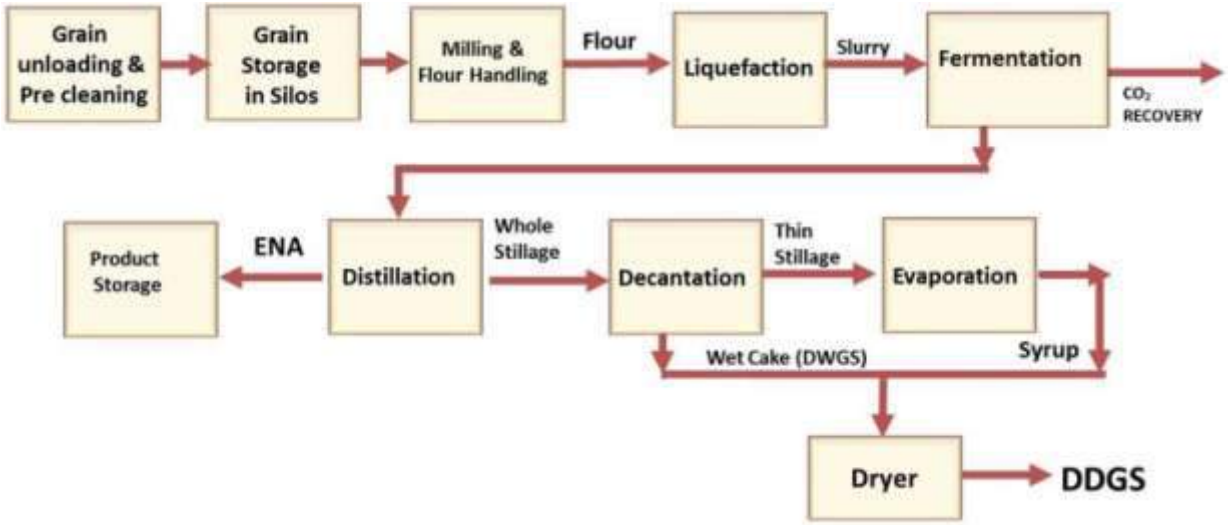
Carbon dioxide recovery system (By product)

Carbon dioxide produced during fermentation will be recovered by means of scrubbing arrangement, chemical treatment drying process and finally liquefaction.

CO_2 gas will pass through scrubbing tower, where the gas is scrubbed with water. From the scrubber after washing the gas is passed through air compressor and then the gas will pass through a tower containing sodium dichromate to eliminate the impurities, if any and then to drying arrangement with sulphuric acid. Subsequently it passes through a tower containing coke coated with washing soda to eliminate odour. The scrubber blowdown will be recycled into the fermentors. Finally it goes to the chilling unit to cool the gas before passing through different cylinders, where the cooled gas will be filled into the cylinders under pressure.

Total CO_2 produced after expansion project will be from distillery plant : 55.2 T/day. This carbon dioxide in cylinders will be sold to industries like soft drink manufacturing units, etc.

Process Flow Sheet for Grain based Distillery is shown in fig 2.5.



STEAM REQUIRED FOR THE DISTILLERY

The steam required for the existing plant is being taking from 25 TPH Boiler and is adequate as there will not be any further increase in steam requirement due to reduction in specific steam consumption.

2.9.ENVIRONMENTAL MITIGATION MEASURES

A. Air Emission Control:

A stack height of 45 Meter have been provided for existing 25 TPH boiler as per CPCB norms for effective dispersion of pollutants into the atmosphere. High efficiency Bag filters have been provided for bringing down PM emission to < 50 mg/Nm^3. The same 25 TPH Boiler is adequate for expansion project, as there will not be any further increase in steam requirement due to reduction in specific steam consumption.

B. Waste water:

There will be no additional thin slop generation with 75 KLPD production. In the existing 60 KLPD plant, Spent wash (6 % w/w solids) is initially being treated in a decanter and the supernatant is concentrated in the Multilple Effect Evaporators (MEE) up to 30-35% solids (w/w). This concentrated spent wash is sent to the drier along with wet cake generated from Decanter and the output is a dry powder with 90% solids and is known as DDGS. This DDGS will be used as cattle feed.

Thus zero spent wash discharge will be implemented for spent wash treatment to comply with CPCB stipulation. Non process effluents will be sent to ETP and after ensuring compliance with CPCB/APPCB standards, the treated effluent will be utilised for dust suppression, ash conditioning and for greenbelt development

C. Noise:

Acoustic enclosure have been provided to STG. All the machinery have been complying with noise levels stipulated by MOEF vide notification dated 14-02-2000. Ear mufflers have been provided to all employees. No additional machinery will be required to enhance the capacity. Hence there will not be any adverse impact on noise environment due to the proposed expansion project.

D. Solid waste:

Ash generation remains 45 TPD only as the same Boiler is adequate for 75 KLPD capacity also. The same silo is adequate for ash storage.

DWGS generation will be 60 TPD from 75 KLPD plant. There is no disposal problem with DDGS as it is a value added byproduct which will be used as cattle/poultry/fish feed.

2.10 ASSESSMENT OF NEW & UNTESTED TECHNOLOGY FOR THE RISK OF TECHNOLOGICAL FAILURE

Fermentation technology for production of alcohol is well proven technology all over the world Existing plant is also in operation for a few years. The present proposal is only enhancement of production through process modifications. Hence there will not be any risk of technological failure from this proposal.

CHAPTER – 3
DESCRIPTION OF ENVIRONMENT
(BASELINE ENVIRONMENTAL STATUS)

3.1 INTRODUCTION

This chapter gives an idea and description of environmental status of the study area with reference to the prominent environmental attributes. The general study area covers 10 Km. radius of the plant site. The impact identification always commences with the collection of baseline data such as ambient air quality, ground water quality, noise levels, land environment, land use pattern, flora & fauna and socio economic aspects with in the study zone of 10 Km. radius during **December, 2016 to February, 2017.**

Baseline data has been collected pertaining to Ambient Air, Noise, Water & Soil by an external laboratory M/s. Universal Enviro Associates (UEA), which is MoEF&CC recognized Laboratory. Due care has been taken by Pioneer Enviro to ensure that calibrated samplers / equipment / instruments have been utilized for sampling & analysis. Adequate care has also been taken to ensure proper Preservation & Transportation methods in accordance with the standard procedures. It is ensured by Pioneer Enviro that Standard operating Procedures have been followed by M/s. UEA.

Calibration:

Calibrated samplers / Instruments have been used for Baseline data Collection & Analysis.

3.2 AIR ENVIRONMENT: [GENERIC TOR # 6 (i)]

3.2.1 METEOROLOGY

Meteorology of the study area plays an important role in the air pollution studies. The prevailing micro meteorological conditions at the plant site will regulate the dispersion and dilution of air pollutants in the atmosphere. The predominant wind directions and the wind speed will decide the direction and distance of the most affected zone from the proposed expansion activity. The meteorological data collected during the monitoring period is very useful in interpretation of baseline data as input for dispersion models for predicting the Ground Level Concentrations (GLC).

3.2.2 METEOROLOGICAL DATA RECORDED AT SITE

A Temporary Weather Monitoring Station was installed at the plant site and temperature, relative humidity, wind direction, wind speed, and rainfall were recorded for one season from **December, 2016 to February, 2017.**

Temperature

The maximum temperature recorded was 32.8 ^{0}C and the minimum temperature was 10.2^{0}C at the weather monitoring station at the plant site.

Relative humidity

Relative humidity at site ranged from 55% to 73%.

Rain fall recorded at the site

The total rainfall recorded during the study period is nil

Wind Pattern at Project Site during the study period

Wind speed and direction are recorded at site every hour. The predominant winds during this season are mostly from E to W.

The wind rose diagram at site is shown in fig. 3.1.

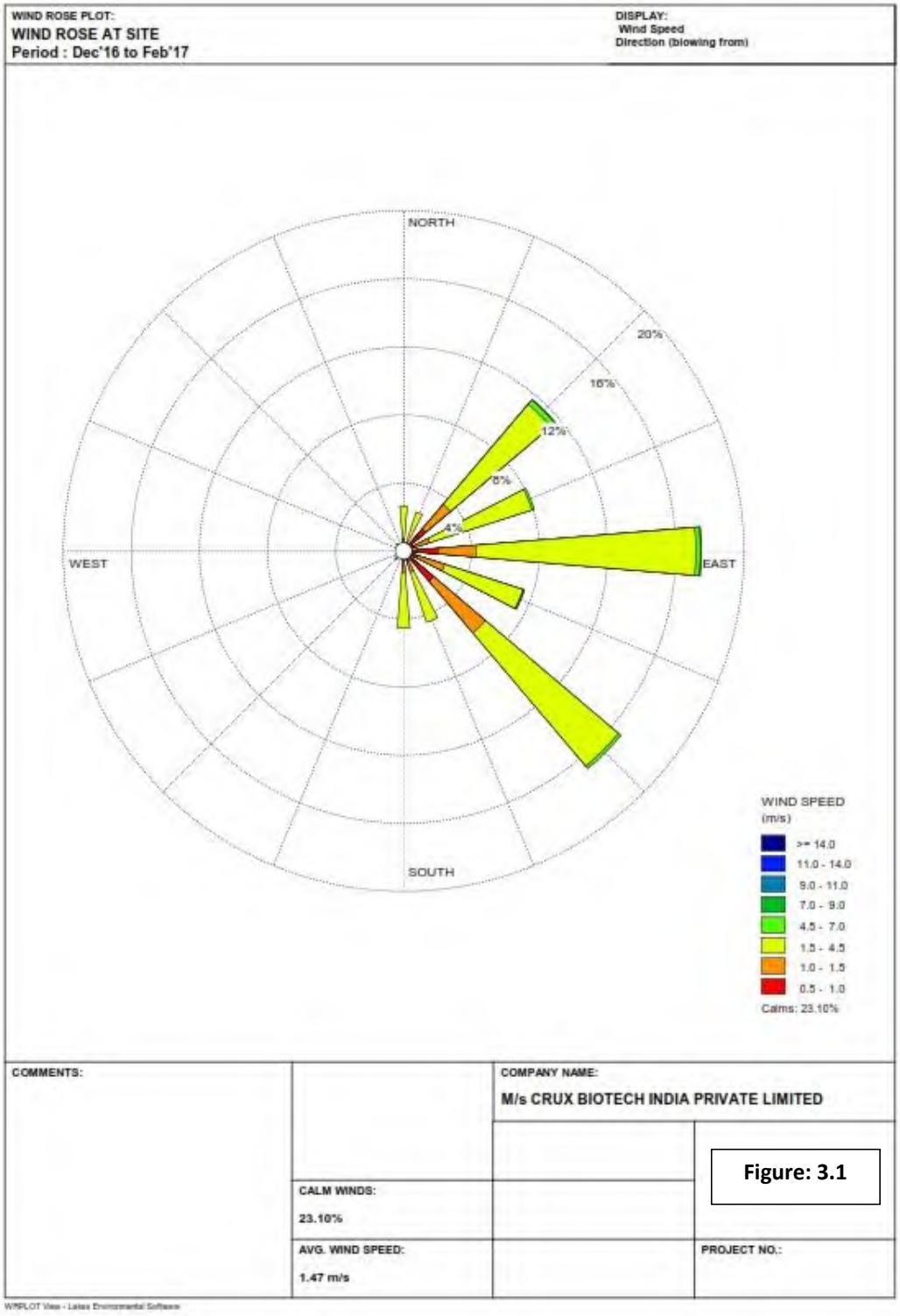

WIND ROSE PLOT:
WIND ROSE AT SITE
Period : Dec'16 to Feb'17
DISPLAY:
Wind Speed
Direction (blowing from)
NORTH
EAST
SOUTH
WEST
20%
16%
12%
8%
4%
WIND SPEED
(m/s)
>= 14.0
11.0 - 14.0
9.0 - 11.0
7.0 - 9.0
4.5 - 7.0
1.5 - 4.5
1.0 - 1.5
0.5 - 1.0
Calms: 23.10%
COMMENTS:
COMPANY NAME:
M/s CRUX BIOTECH INDIA PRIVATE LIMITED
CALM WINDS:
23.10%
AVG. WIND SPEED:
1.47 m/s
PROJECT NO.:

Figure: 3.1

3.2.3 AIR QUALITY: [GENERIC TOR # 6 ii]

The ambient air quality with respect to the study zone of 10 Km. radius around the plant site forms the baseline information. The study area represents mostly rural environment. The various sources of air pollution in the region are vehicular traffic, dust arising from unpaved village roads. The Prime objective of baseline air quality survey is to assess the existing air quality of the area. This will also be useful is assessing the conformity to standards of the ambient air quality during the plant operation. AAQ is being monitored in the existing plant and air quality is within the National Ambient Air Quality standards.

3.2.3.1 SELECTION OF SAMPLING STATIONS

The base line status of the ambient air quality can be assessed through scientifically designed Ambient Air Quality Monitoring Network.

The selection of sampling locations in the air quality surveillance programme is based on the following as per CPCB guidelines

(a) Representation of plant site.

(b) Representation of down wind direction.

(c) Representation of cross sectional distribution in the down wind direction.

(d) Representation of residential areas.

3.2.3.2 PARAMETERS MONITORED

At each Monitoring station $PM_{2.5}$, PM_{10}, SO_2, NO_X and CO are monitored. The sampling was carried out for 2 days in a week for three months **(from December, 2016 to February, 2017)** to assess the existing status of air pollution and pollution dispersion pattern over the whole air basin of plant site. $PM_{2.5}$, PM_{10} , SO_2, NO_X and CO are sampled as per MoEF guidelines.

3.2.3.3 SAMPLING & ANALYTICAL TECHNIQUES INSTRUMENTS USED FOR SAMPLING

Envirotech RDS, APM 550 dust samplers pertaining to **M/s. Universal Enviro Associates** (UEA) have been used for monitoring $PM_{2.5}$, PM_{10}, SO_2, NOx and CO. $PM_{2.5}$ & PM_{10} are estimated by gravimetric method West & Gaeke method (IS –5182, part III 1969) has been adopted for estimation of SO_2, Jacob – Hochheiser method (IS –5182, part IV, 1975) has been adopted for estimation of NOx. CO was analyzed on Gas Chromatograph. The standard operating Procedures of **M/s. Universal Enviro Associates** have been used for sampling and analysis.

Calibration

Calibration charts have been prepared for all gaseous pollutants. The Calibration is carried out when new absorbing solutions are prepared.

TABLE 3.2.1

TECHNIQUES USED FOR AMBIENT AIR QUALITY MONITORING

S.No	Parameter	Technique	Minimum Detectable Limit (µg /m^3)
1.	Particulate Matter ($PM_{2.5}$)	APM 550 dust sampler (Gravimetric Method)	5.0
2.	Particulate Matter (PM_{10})	Respirable Dust Sampler (Gravimetric Method)	5.0
3.	SO_2	EPA Modified West & Gaeke method	4.0
4.	NOx	Arsenite modified Jacob & Hochheiser	4.5
5.	CO	Gas Chromatography	12.5

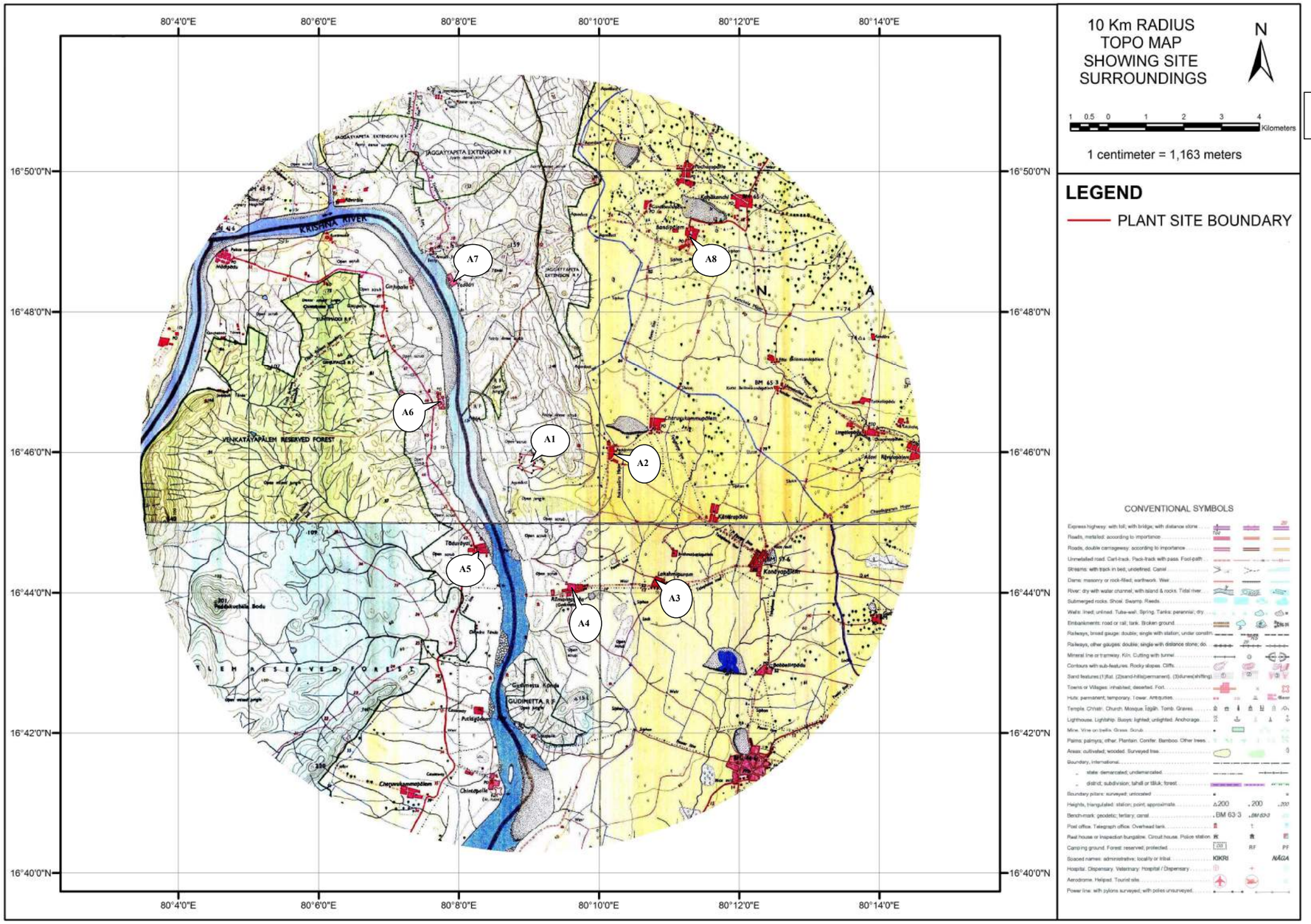
Eight nos. of Ambient Air Quality Monitoring Stations were established with in the study zone of the plant site in accordance with CPCB guidelines.

The sampling locations and their distances are shown in Table 3.2.2 and in fig 3.2 The Max., Min. and 98th percentile values for all the sampling locations for $PM_{2.5}$, PM_{10} , SO_2, NO_X and CO are shown in Table 3.2.3 to 3.2.10.

TABLE 3.2.2

AMBIENT AIR QUALITY MONITORING STATIONS

S.No.	STATION	DIRECTION w.r.t. Site	DISTANCE (in KMS.) w.r.t. Site	CRITERIA FOR SELECTION
1.	plant Site	-----	-----	Represents the plant Site
2	Peddavaram	E	1.9	Represents the Nearest habitation & Crosswind direction
3	Lakshmipuram	SE	4.5	Represents the Upwind direction
4	Rammanapeta	S	3.0	Represents the densely populated area
5	Toduvayai	SW	2.7	Represents the Crosswind direction
6	Challagariga	NW	2.2	Represents the Downwind direction & Sensitive area
7	Vedadri	NNW	5.2	Represents the Downwind direction & Sensitive area
8	Bandipalem	NE	6.8	Represents the Crosswind direction



10 Km RADIUS TOPO MAP SHOWING SITE SURROUNDINGS

N

1 0.5 0 1 2 3 4 Kilometers

1 centimeter = 1,163 meters

LEGEND

PLANT SITE BOUNDARY

CONVENTIONAL SYMBOLS

AMBIENT AIR QUALITY MONITORING STATIONS A

FIGURE - 3.2

TABLE 3.2.3			
Sampling Location: **Plant site**		Sampling Period: **Dec' 16 to Feb'17**	
Unit : **µg/m^3**			
Parameter	**Maximum**	**Minimum**	**98th percentile**
$PM_{2.5}$	34.0	29.4	34.0
PM_{10}	56.7	48.9	56.7
SO_2	12.7	10.5	12.7
NOx	14.9	11.8	14.9
CO	568	423	568

TABLE 3.2.4			
Sampling Location: **Peddavaram**		Sampling Period: **Dec' 16 to Feb'17**	
Unit : **µg/m^3**			
Parameter	**Maximum**	**Minimum**	**98th percentile**
$PM_{2.5}$	18.9	14.3	18.9
PM_{10}	31.5	23.9	31.5
SO_2	10.1	8.9	10.1
NOx	11.7	9.9	11.7
CO	410	325	410

TABLE 3.2.5			
Sampling Location: **Lakshmipuram**		Sampling Period: **Dec' 16 to Feb'17**	
Unit : **µg/m^3**			
Parameter	**Maximum**	**Minimum**	**98th percentile**
$PM_{2.5}$	17.1	12.8	17.1
PM_{10}	28.6	21.4	28.6
SO_2	9.5	7.9	9.5
NOx	10.4	9.1	10.4
CO	374	315	374

TABLE 3.2.6			
Sampling Location: **Ramannapeta**		Sampling Period: **Dec' 16 to Feb'17**	
Unit : **µg/m^3**			
Parameter	**Maximum**	**Minimum**	**98th percentile**
$PM_{2.5}$	28.3	23.3	28.3
PM_{10}	47.2	38.9	47.2
SO_2	10.3	9.1	10.3
NOx	12.4	10.4	12.4
CO	473	394	473

TABLE 3.2.7	
Sampling Location: **Toduvayai**	Sampling Period: **Dec' 16 to Feb'17**
Unit : **µg/m^3**	

Parameter	Maximum	Minimum	98th percentile
$PM_{2.5}$	17.6	14.6	17.6
PM_{10}	29.4	23.7	29.4
SO_2	8.4	6.9	8.4
NOx	9.2	7.8	9.2
CO	334	287	334

TABLE 3.2.8

Sampling Location: **Challagariga** Sampling Period: **Dec' 16 to Feb'17**

Unit : **µg/m³**

Parameter	Maximum	Minimum	98th percentile
$PM_{2.5}$	16.1	12.6	16.1
PM_{10}	26.7	21.0	26.7
SO_2	8.2	6.9	8.2
NOx	9.1	7.9	9.1
CO	320	275	320

TABLE 3.2.9

Sampling Location: **Vedadri** Sampling Period: **Dec' 16 to Feb'17**

Unit : **µg/m³**

Parameter	Maximum	Minimum	98th percentile
$PM_{2.5}$	18.8	14.9	18.8
PM_{10}	31.4	24.9	31.4
SO_2	9.8	8.0	9.8
NOx	10.7	9.5	10.7
CO	385	304	385

TABLE 3.2.10

Sampling Location: **Bandipalem** Sampling Period: **Dec' 16 to Feb'17**

Unit : **µg/m³**

Parameter	Maximum	Minimum	98th percentile
$PM_{2.5}$	26.8	22.0	26.8
PM_{10}	44.7	36.7	44.7
SO_2	9.9	8.5	9.9
NOx	11.2	9.4	11.2
CO	406	358	406

The 98th percentile $PM_{2.5}$ concentration at the plant site is 34.0 µg/m³ and that of PM_{10} is 56.7 µg/m³ The 98th percentile SO_2 & NOx concentrations recorded at the project site are 12.7 µg/m³ & 14.9 µg/m³ respectively. The 98th percentile concentrations of CO recorded at the project site is

568 µg/m^3 .The maximum 98th percentile $PM_{2.5}$ concentration was recorded at plant site with a value of 34.0 µg/m^3. The maximum 98th percentile PM_{10} concentration was recorded at plant site with a value of 56.7 µg/m^3. The maximum 98th percentile SO_2 concentration was recorded at plant site with a value of 12.7 µg/m^3. The maximum 98th percentile NO_x concentration was recorded at the plant site with a value of 14.9 µg/m^3. The maximum 98th percentile CO concentration was recorded at plant site with a value of 568 µg/m^3.

3.3 NOISE ENVIRONMENT

The physical description of sound concerns its loudness as a function of frequency. Noise in general is sound, which is composed of many frequency components of various loudness distributed over the audible frequency range. Various noise scales have been introduced to describe, in a single number, the response of an average human being to a complex sound made up of various frequencies at different loudness levels. The most common and heavily favoured of those scales is the weighted decibel (dBA). This is more suitable for audible range of 20 to 20,000 Hertz. The scale has been designed to weigh various components of noise according to the response of a human ear.

The impact of noise sources on surrounding community depends on

- Characteristics of noise sources (instantaneous, intermittent or continuous in nature). It is well known that steady noise is not as annoying as one that is continuously varying in loudness.
- The time at which noise occurs, for example loud noise levels at night in residential areas are not acceptable because of sleep disturbance.
- The location of the noise source, with respect to noise sensitive area, which determines the loudness and period of noise exposure.

The environmental impact of noise can have several effects varying from Noise Induced Hearing Loss (NIHL) to annoyance depending on loudness of Noise levels.

The environmental impact assessment of noise from the plant can be carried out by taking into consideration of various factors: potential damage to hearing, potential physiological responses, annoyance and general community responses.

The main objective of noise level monitoring is to assess the background noise levels in different zones viz., industrial, commercial, residential and silence zones within the study area.

The basic studies conducted were

a. Assessment of background noise levels.
b. Identification and monitoring the major noise generating sources in the study area.
c. Impact of noise on general population in the study zone of 10 Km. radius.

3.3.1 RECONNAISSANCE

Noise levels were measured at different locations within 10 Km. radius of the plant site such as villages, bus stands etc.

3.3.1.1 BACKGROUND NOISE

Baseline noise data has been measured at different locations using A-weighted sound pressure level meter. The equivalent day-night noise levels in the study zone are ranging from **66.12 dBA to 44.75 dBA.**

3.3.1.2 SOURCES OF NOISE

Typical considerations in environmental noise assessment can be divided into two categories; one is related to noise sources and the other related to potential receiver.

Two quantities are needed to describe completely the strength of the source. They are sound power level and directivity. Sound power levels measures the total sound power radiated by the source in all directions whereas directivity is a measure of difference in radiation with direction. This concept of sound power level and directivity index makes it possible to calculate the sound pressure level created by the source.

3.3.2 COMMUNITY NOISE

The ambient noise level is characterized by significant variations above a base or a residual noise level. The residual noise level is that level below which the ambient noise does not seem to drop during a given time interval and is generally caused by the unidentified distant sources. It differs in rural and urban areas. At night, its level is low due to lesser elements of noise. The annoyance that people experience depends upon the number of noise elements that produce noise concurrently at a given time that occur during a time interval.

The noise rating developed by EPA for specification of community noise from all sources is the day night sound level, Ldn. It is similar to a 24 hour equivalent sound level except that during the night period, which extends from 10.00 p.m. to 6.00 a.m. A 10 dBA weighing penalty is added to the account for the fact that noise at night when people are trying to sleep is judged more annoying than the same noise during the day time.

The Ldn for a given location in a community is calculated from an hourly equivalent sound level given be the following equation.

$$Ldn = 10 \log (1/24 [15 (10^{(Ld/10)} + 9 (10^{(Ln+10)/10)}])$$

Where Ld is the equivalent noise level during day time (6A .M. to 10 P.M.)

Ln is the equivalent noise level during night time (10 P.M. to 6 A.M.)

3.3.2.1 OCCUPATIONAL EXPOSURE

To assess the magnitude of impact due to noise sources, it is essential to know the following.

a. The duration of sound.
b. Distribution through the working day.
c. Overall noise levels.
d. It's composition including frequency and intensity at various intervals of time.

Other factors regarding receiver include

a. The age of the individual.
b. The sensitivity of the individual.
c. The efficiency of the protective devices used.

After characterizing the noise sources noise at receiver's location, the impact must be assessed. The environmental impact of noise can lead to the following effects.

a. Damages the hearing capacity.
b. Interference in communication.
c. Interference with work.
d. Interference with sleep.
e. Causes annoyance

3.3.3 METHODOLOGY ADOPTED FOR NOISE LEVEL OBSERVATION

For measurement of Ambient Noise level in the Study area, a Digital Sound Level Meter *(Make & Model: Lutron SL-4001)* was used. The instrument was calibrated with a Standard Acoustic calibrator before using in the field. The measurements were carried out continuously for the 24-hour period to obtain hourly equivalent sound pressure level, 1 hour Leq. From these values, day and night time as well as 24-hour Leq values were also calculated. The Leq is the equivalent continuous sound level, which is equivalent to the same sound energy as the fluctuating sound measured in the same period.

Guidance for assessment of representativeness and reliability of baseline environmental attributes

Attributes	Sampling		Measurement Method	Remarks
Noise	**Network**	**Frequency**		
Hourly equivalent noise levels	Identified study area	Once in each season	Instrument : Noise level meter	IS:4954-1968 as adopted by CPCB
Hourly equivalent noise levels	In plant (1.5 metre from machinery)	Once	Instrument : Noise level meter	CPCB/OSHA
Hourly equivalent noise levels	Highways	Once in each season	Instrument : Noise level meter	CPCB/IS:4954-1968
Peak particle velocity	150 - 200m from blast site	Once	PPV meter	---

3.3.4 NOISE LEVEL OBSERVATIONS IN THE STUDY AREA: [GENERIC TOR # 6 vii]

Baseline noise levels have been monitored at different locations within the study zone of the plant site. 8 nos. of stations have been selected for measurement of noise levels and their distances with respect to site are shown in table 3.3.1. Equivalent Day Night Noise Level are shown in Table 3.3.2.

TABLE 3. 3 .1

NOISE LEVEL MONITORING STATIONS

S.No.	STATION	DIRECTION	DISTANCE IN (KMS.)	CRITERIA FOR SELECTION
1.	Plant site	-----	-----	Represents the Industrial area
2.	Peddavaram	E	1.8	Represents nearest residential area
3.	Lakshmipuram	SE	4.8	Represents commercial area (Bus stop)

4.	Rammanapeta	S	3.5	Represents commercial area (Bus stop)
5.	Toduvayai	SW	2.9	Represents Residential area
6	Challagariga	NW	2.4	Represents Residential area
7	Vedadri	NNW	5.6	Represents Residential area
8	Bandipalem	NE	6.9	Represents Residential area

TABLE 3.3.2

EQUIVALENT DAY NIGHT NOISE LEVEL

S.NO.	LOCATION	EQUIVALENT NOISE LEVELS (dBA)			Standard
		DAY	NIGHT	DAY-NIGHT	
1.	Plant site*	65	58	66.12	Industrial Area * Daytime – 75 dBA Night time – 70 dBA Commercial Area ** Daytime – 65 dBA Night time – 55 dBA Residential Daytime – 55 dBA Night time – 45 dBA Silence zone # Daytime – 50 dBA Night time – 40 dBA
2.	Peddavaram	50	42	50.75	
3.	Lakshmipuram **	56	43	54.87	
4.	Rammanapeta **	58	45	56.87	
5.	Toduvayai	45	38	46.12	
6.	Challagariga	44	36	44.75	
7.	Vedadri	49	40	49.37	
8.	Bandipalem	48	39	48.37	

3.4 WATER QUALITY IMPACTS

The water samples have to be collected and analyzed for various parameters like pH, Suspended Solids, Total Dissolved Solids, Temperature, Total Hardness, Calcium Hardness, Magnesium hardness, Alkalinity, Fluoride, Chloride, Sulphates, Nitrates, Chemical Oxygen Demand (COD) and for various heavy metals and is compared with the standards to know the water quality. Selection of sampling locations will be generally done based on the following factors:

i. Proximity of the industries to the site.
ii. Residential areas.
iii. Representation of plant site.
iv. Representing u/s , d/s of the river
v. Representing agricultural land

3.4.1 SURFACE WATER QUALITY ASSESSMENT: [GENERIC TOR # 6 iv]

Krishna river is situated at a distance of 1.3 Kms. from the plant site. Two nos. of surface water samples were collected from upstream & downstream to assess surface water quality. These water samples are analysed for various parameters as per IS: 2296. The surface water characteristics were shown in table No. 3.4.1.

TABLE 3.4.1

SURFACE WATER QUALITY (Krishna River)					
S.NO.	**PARAMETER**	**UNIT**	**UPSTREAM**	**DOWNSTREAM**	**STANDARD AS PER BIS: 2296**
PHYSICAL CHARACTERISTICS					
1.	Colour		-----	-----	-----
2.	pH		7.7	7.7	6.5-8.5
3.	Turbidity	NTU	4	4	-----
4.	Electrical Conductivity	ms/cm	335	331	-----
5.	Total Dissolved Solids	mg/l	222	227	1500
CHEMICAL CHARACTERISTICS					
6.	Total Hardness	mg/l	148	144	1500
7.	Calcium Hardness	mg/l	92	91	200
8.	Magnesium Hardness	mg/l	56	53	100
9.	Alkalinity	mg/l	41	42	-----
10.	Sulphates	mg/l	13	13	400
11.	Chlorides	mg/l	89	91	600
12.	Nitrates as NO_3	mg/l	8	7	20
13.	Fluoride as F	mg/l	0.35	0.34	1.5
14.	Sodium as Na	mg/l	22	20	-----
15.	COD	mg/l	5	4	3.0
16.	DO	mg/l	6.3	6.0	4.0
17.	Cyanides as CN^-	mg/l	<0.01	<0.01	0.05
18.	Phenols as C_6H_5OH	mg/l	Absent	Absent	0.005
19.	Hexavalent chromium as Cr	mg/l	<0.01	<0.01	0.05
20.	Iron as Fe	mg/l	0.34	0.33	50
21.	Copper as Cu	mg/l	<0.01	<0.01	1.5
22.	Arsenic as As	mg/l	<0.01	<0.01	0.2
23.	Selenium	mg/l	<0.01	<0.01	<0.01
24.	Cadmium as cd	mg/l	<0.01	<0.01	<0.01

25.	Boron as B	mg/l	<0.01	<0.01	<0.01
26.	Mercury as Mg	mg/l	<0.001	<0.001	<0.01
27.	Lead as Pb	mg/l	<0.01	<0.01	<0.01
28.	Silica as SiO_2	mg/l	3.6	4.1	----
29.	Mineral oil	mg/l	<0.01	<0.01	<0.01
30.	Total coliforms	(MPN/100 ml)	65	62	5000

Surface water (Ponds) at 8 locations was collected & are locations are furnished in Table 3.4.2 and were also analysed and is same is furnished in Table No. 3.4.3.

Table 3.4.2

SURFACE WATER (Ponds) QUALITY SAMPLING STATIONS

S.NO	LOCATION	DIRECTION W.R.T. PROJECT SITE	DISTANCE B/W SAMPLING POINT TO PROJECT SITE
1)	Jayanthipuram Pond (SW 1)	NNW	9.7
2)	Pochampalle Pond (SW 2)	NNE	7.8
3)	Bondipalem Pond (SW 3)	NE	7.3
4)	Cheruvukommupalem Pond (SW 4)	E	2.2
5)	Kondyapalem Pond (SW 5)	SEE	6.0
6)	Bobbellapdu Pond (SW 6)	SE	6.3
7)	Chandrapadu Pond (SW 7)	SSE	8.2
8)	Rammanapeta Pond (SW 8)	SSE	2.2

The analysis of the samples shows that all the parameters are in accordance with BIS-2296 specifications.

TABLE 3.4.3
OTHER SURFACE WATER ANALYSIS

SAMPLING PERIOD: DECEMBER, 2017				SAMPLING LOCATIONS							
S.NO.	**PARAMETER**	**UNIT**	**Standard as per BIS: 2296**	**SW 1 (Pond)**	**SW 2 (Pond)**	**SW 3 (Pond)**	**SW 4 (Pond)**	**SW 5 (Pond)**	**SW 6 (Pond)**	**SW 7 (Pond)**	**SW 8 (Pond)**
PHYSICAL CHARACTERISTICS											
1.	Colour	---	-----	-----	-----	-----	-----	-----	-----	-----	-----
2.	pH	---	6.5-8.5	7.6	7.5	7.5	7.6	7.7	7.4	7.7	7.5
3.	Turbidity	NTU	-----	5	4	5	4	5	5	5	4
4.	Electrical Conductivity	ms/cm	-----	352	363	370	362	354	360	347	371
5.	Total Dissolved Solids	mg/l	1500	225	229	211	221	218	205	215	222
CHEMICAL CHARACTERISTICS											
6.	Total Hardness	mg/l	1500	163	165	174	165	174	161	158	170
7.	Calcium Hardness	mg/l	200	98	100	110	95	111	99	95	100
8.	Magnesium Hardness	mg/l	100	65	65	64	70	63	62	63	70
9.	Alkalinity	mg/l	-----	47	52	59	62	55	59	70	63
10.	Sulphates	mg/l	400	67	62	69	70	74	71	77	75
11.	Chlorides	mg/l	600	68	63	71	60	59	65	57	66
12.	Nitrates as NO_3	mg/l	20	6.3	5.5	5.0	6.5	5.1	5.2	6.0	5.5
13.	Fluoride as F	mg/l	1.5	0.40	0.44	0.39	0.50	0.48	0.60	0.50	0.48
14.	Sodium as Na	mg/l	-----	28	41	39	45	43	44	48	47
15.	BOD	mg/l	3.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
16.	DO	mg/l	6.0	5.5	5.4	5.5	5.0	5.1	5.8	5.1	5.5
17.	Cyanides as CN^-	mg/l	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
18.	Phenols as C_6H_5OH	mg/l	0.005	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
19.	Hexavalent chromium as Cr	mg/l	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
20.	Iron as Fe	mg/l	50	0.20	0.24	0.29	0.24	0.33	0.32	0.36	0.28

SAMPLING PERIOD: DECEMBER, 2017				SAMPLING LOCATIONS							
S.NO.	PARAMETER	UNIT	Standard as per BIS: 2296	SW 1 (Pond)	SW 2 (Pond)	SW 3 (Pond)	SW 4 (Pond)	SW 5 (Pond)	SW 6 (Pond)	SW 7 (Pond)	SW 8 (Pond)
21.	Copper as Cu	mg/l	1.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
22.	Arsenic as As	mg/l	0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
23.	Selenium	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
24.	Cadmium as cd	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
25.	Boron as B	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26.	Mercury as Mg	mg/l	<0.01	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
27.	Lead as Pb	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28.	Silica as SiO_2	mg/l	----	3.5	2.9	3.0	3.3	3.6	3.6	3.5	4.0
29.	Mineral oil	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
30.	Total coliforms	(MPN/100 ml)	5000	87	98	79	82	77	91	88	95

BDL – Below Detectable Level

3.4.2 GROUND WATER QUALITY ASSESSMENT: [GENERIC TOR # 6 vi]

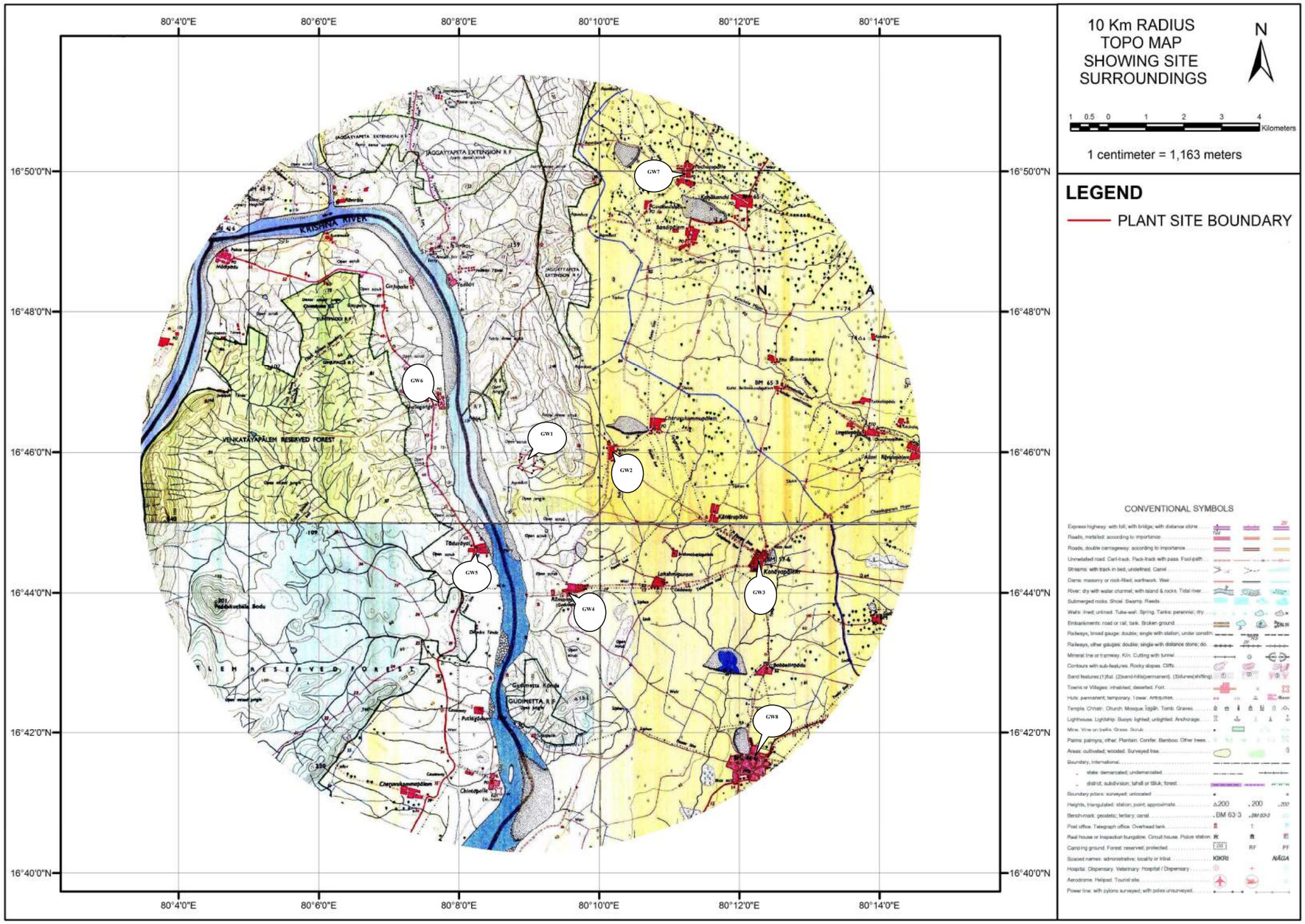
The ground water samples have been collected and analyzed for various parameters like pH, Suspended Solids, Total Dissolved Solids, Temperature, Total Hardness, Calcium Hardness, Magnesium hardness, Alkalinity, Fluoride, Chloride, Sulphates, Nitrates, Phenolic compounds, Heavy metals etc. and is compared with the standards to know the water quality. Selection of sampling locations will be generally done based on the following factors:

- Representation of project site.
- Topography
- Industrial Areas
- Residential areas
- Agricultural Activity

Eight numbers of ground water samples from open wells / bore wells were collected from the nearby villages to assess ground water quality impacts. The ground water sampling locations and their distances from the proposed plant site were shown in table 3.4.4. The water quality sampling stations are shown in fig. 3.3. The ground water characteristics were shown in table No. 3.4.5 to 3.4.12. All the water samples collected shows that they are suitable for potable purpose.

TABLE 3.4.4

GROUND WATER QUALITY MONITORING STATIONS			
S.NO	**STATION**	**DIRECTION w.r.t. Site**	**DISTANCE (in KMS.) w.r.t. Site**
1.	Plant Site	-----	-----
2.	Peddavaram (Residential)	E	1.7
3.	Konayapalem (Residential)	SE	3.5
4.	Ramannapeta (upstream)	S	2.8
5.	Toduvayai (Agricultural area & adjacent to River)	SW	2.3
6.	Challagariga (downstream)	NW	2.5
7.	Pochampalle (Upstream)	NE	8.0
8.	Chandarlapadu (downstream)	SSE	6.0



10 Km RADIUS TOPO MAP SHOWING SITE SURROUNDINGS

N

1 0.5 0 1 2 3 4 Kilometers

1 centimeter = 1,163 meters

LEGEND

PLANT SITE BOUNDARY

CONVENTIONAL SYMBOLS

GROUND WATER QUALITY MONITORING STATIONS GW

FIGURE - 3.3

PIONEER ENVIRO Laboratories & Consultants Pvt. Ltd

TABLE 3.4.5			
GROUND WATER QUALITY ANALYSIS			
Station : **Plant Site**			Month: **December, 2016**
S.NO.	**PARAMETER**	**UNIT**	**SAMPLE**
	PHYSICAL CHARACTERISTICS		
1.	Colour	Hazen	-----
2.	pH		7.4
3.	Turbidity	NTU	1.3
4.	Electrical Conductivity	ms/cm	663
5.	Total Dissolved Solids	mg/l	438
	CHEMICAL CHARACTERISTICS		
6.	Total Hardness	mg/l	255
7.	Calcium Hardness	mg/l	170
8.	Magnesium Hardness	mg/l	85
9.	Alkalinity	mg/l	103
10.	Sulphates	mg/l	65
11.	Chlorides	mg/l	97
12.	Nitrates as NO_3	mg/l	2.6
13.	Fluoride as F	mg/l	0.67
14.	Sodium as Na	mg/l	62
15.	COD	mg/l	4
16.	Residual chlorine	mg/l	<0.01
17.	Cyanides as CN^-	mg/l	<0.01
18.	Phenols as C_6H_5OH	mg/l	Absent
19.	Hexavalent chromium as Cr^{6+}	mg/l	<0.01
20.	Iron as Fe	mg/l	0.02
21	Copper as Cu	mg/l	<0.01
22	Arsenic as As	mg/l	<0.01
23.	Selenium as Se	mg/l	<0.01
24.	Cadmium as cd	mg/l	<0.01
25.	Boron as B	mg/l	<0.01
26.	Mercury as Hg	mg/l	<0.001
27.	Lead as Pb	mg/l	<0.01
28.	Silica as SiO_2	mg/l	3.5
29.	Manganese as Mn	mg/l	<0.01
30.	Total coliforms	(MPN/100 ml)	Absent

TABLE 3.4.6			
GROUND WATER QUALITY ANALYSIS			
Station: **Peddavaram**			Month: **December, 2016**
S. NO.	**PARAMETER**	**UNIT**	**SAMPLE**
	PHYSICAL CHARACTERISTICS		
1.	Colour	Hazen	---
2.	PH	--	7.4
3.	Turbidity	NTU	2.2
4.	Electrical Conductivity	ms/cm	581
5.	Total Dissolved Solids	mg/l	401
	CHEMICAL CHARACTERISTICS		
6.	Total Hardness	mg/l	241
7.	Calcium Hardness	mg/l	163
8.	Magnesium Hardness	mg/l	78
9.	Alkalinity	mg/l	124
10.	Sulphates	mg/l	85
11.	Chlorides	mg/l	135
12.	Nitrates as NO_3	mg/l	2.5
13.	Fluoride as F	mg/l	0.62
14.	Sodium as Na	mg/l	66
15.	COD	mg/l	4
16.	Residual chlorine	mg/l	<0.01
17.	Cyanides as CN^-	mg/l	<0.01
18.	Phenols as C_6H_5OH	mg/l	Absent
19.	Hexavalent chromium as Cr	mg/l	<0.01
20.	Iron as Fe	mg/l	0.025
21.	Copper as Cu	mg/l	<0.01
22.	Arsenic as As	mg/l	<0.01
23.	Selenium	mg/l	<0.01
24.	Cadmium as cd	mg/l	<0.01
25.	Boron as B	mg/l	<0.01
26.	Mercury as Mg	mg/l	<0.001
27.	Lead as Pb	mg/l	<0.001
28.	Silica as SiO_2	mg/l	3.5
29.	Manganese as Mn	mg/l	<0.01
30.	Total coliforms	(MPN/100 ml)	Absent

TABLE 3.4.7			
GROUND WATER QUALITY ANALYSIS			
Station : **Konayapalem**			Month: **December, 2016**
S. NO.	**PARAMETER**	**UNIT**	**SAMPLE**
	PHYSICAL CHARACTERISTICS		
1.	Colour	Hazen	---
2.	Ph	--	7.6
3.	Turbidity	NTU	2.8
4.	Electrical Conductivity	ms/cm	634
5.	Total Dissolved Solids	mg/l	405
	CHEMICAL CHARACTERISTICS		
6.	Total Hardness	mg/l	210
7.	Calcium Hardness	mg/l	125
8.	Magnesium Hardness	mg/l	85
9.	Alkalinity	mg/l	143
10.	Sulphates	mg/l	66
11.	Chlorides	mg/l	93
12.	Nitrates as NO_3	mg/l	2.3
13.	Fluoride as F	mg/l	0.55
14.	Sodium as Na	mg/l	58
15.	COD	mg/l	4
16.	Residual chlorine	mg/l	<0.01
17.	Cyanides as CN^-	mg/l	<0.01
18.	Phenols as C_6H_5OH	mg/l	Absent
19.	Hexavalent chromium as Cr	mg/l	<0.01
20.	Iron as Fe	mg/l	0.022
21.	Copper as Cu	mg/l	<0.01
22.	Arsenic as As	mg/l	<0.01
23.	Selenium	mg/l	<0.01
24.	Cadmium as cd	mg/l	<0.01
25.	Boron as B	mg/l	<0.01
26.	Mercury as Mg	mg/l	<0.001
27.	Lead as Pb	mg/l	<0.001
28.	Silica as SiO_2	mg/l	3.2
29.	Manganese as Mn	mg/l	<0.01
30.	Total coliforms	(MPN/100 ml)	Absent

TABLE 3.4.8			
GROUND WATER QUALITY ANALYSIS			
Station: **Rammanapeta**			Month: **December, 2016**
S. NO.	**PARAMETER**	**UNIT**	**SAMPLE**
	PHYSICAL CHARACTERISTICS		
1.	Colour	Hazen	-----
2.	pH	--	7.5
3.	Turbidity	NTU	2.0
4.	Electrical Conductivity	ms/cm	665
5.	Total Dissolved Solids	mg/l	421
	CHEMICAL CHARACTERISTICS		
6.	Total Hardness	mg/l	216
7.	Calcium Hardness	mg/l	133
8.	Magnesium Hardness	mg/l	83
9.	Alkalinity	mg/l	108
10.	Sulphates	mg/l	64
11.	Chlorides	mg/l	55
12.	Nitrates as NO_3	mg/l	3.0
13.	Fluoride as F	mg/l	0.62
14.	Sodium as Na	mg/l	47
15.	COD	mg/l	3.5
16.	Residual chlorine	mg/l	<0.01
17.	Cyanides as CN^-	mg/l	<0.01
18.	Phenols as C_6H_5OH	mg/l	Absent
19.	Hexavalent chromium as Cr	mg/l	<0.01
20.	Iron as Fe	mg/l	0.030
21.	Copper as Cu	mg/l	<0.01
22.	Arsenic as As	mg/l	<0.01
23.	Selenium	mg/l	<0.01
24.	Cadmium as cd	mg/l	<0.01
25.	Boron as B	mg/l	<0.01
26.	Mercury as Mg	mg/l	<0.001
27.	Lead as Pb	mg/l	<0.01
28.	Silica as SiO_2	mg/l	3.0
29.	Manganese as Mn	mg/l	<0.01
30.	Total coliforms	(MPN/100 ml)	Absent

TABLE 3.4.9			
GROUND WATER QUALITY ANALYSIS			
Station : **Toduvayai**			Month: **December, 2016**
S. NO.	**PARAMETER**	**UNIT**	**SAMPLE**
	PHYSICAL CHARACTERISTICS		
1.	Colour	Hazen	---
2.	pH	--	7.7
3.	Turbidity	NTU	1.8
4.	Electrical Conductivity	ms/cm	602
5.	Total Dissolved Solids	mg/l	405
	CHEMICAL CHARACTERISTICS		
6.	Total Hardness	mg/l	230
7.	Calcium Hardness	mg/l	153
8.	Magnesium Hardness	mg/l	77
9.	Alkalinity	mg/l	120
10.	Sulphates	mg/l	73
11.	Chlorides	mg/l	55
12.	Nitrates as NO_3	mg/l	2.0
13.	Fluoride as F	mg/l	0.51
14.	Sodium as Na	mg/l	53
15.	COD	mg/l	4
16.	Residual chlorine	mg/l	<0.01
17.	Cyanides as CN^-	mg/l	<0.01
18.	Phenols as C_6H_5OH	mg/l	Absent
19.	Hexavalent chromium as Cr	mg/l	<0.01
20.	Iron as Fe	mg/l	0.019
21.	Copper as Cu	mg/l	<0.01
22.	Arsenic as As	mg/l	<0.01
23.	Selenium	mg/l	<0.01
24.	Cadmium as cd	mg/l	<0.01
25.	Boron as B	mg/l	<0.01
26.	Mercury as Mg	mg/l	<0.001
27.	Lead as Pb	mg/l	<0.01
28.	Silica as SiO_2	mg/l	2.8
29.	Manganese as Mn	mg/l	<0.01
30.	Total coliforms	(MPN/100 ml)	Absent

TABLE 3.4.10			
GROUND WATER QUALITY ANALYSIS			
Station : **Challagariga**			Month: **December, 2016**
S. NO.	**PARAMETER**	**UNIT**	**SAMPLE**
	PHYSICAL CHARACTERISTICS		
1.	Colour	Hazen	-----
2.	pH	--	7.6
3.	Turbidity	NTU	2.3
4.	Electrical Conductivity	ms/cm	658
5.	Total Dissolved Solids	mg/l	417
	CHEMICAL CHARACTERISTICS		
6.	Total Hardness	mg/l	220
7.	Calcium Hardness	mg/l	125
8.	Magnesium Hardness	mg/l	95
9.	Alkalinity	mg/l	127
10.	Sulphates	mg/l	78
11.	Chlorides	mg/l	55
12.	Nitrates as NO_3	mg/l	3.1
13.	Fluoride as F	mg/l	0.62
14.	Sodium as Na	mg/l	53
15.	COD	mg/l	3
16.	Residual chlorine	mg/l	<0.01
17.	Cyanides as CN^-	mg/l	<0.01
18.	Phenols as C_6H_5OH	mg/l	Absent
19.	Hexavalent chromium as Cr	mg/l	<0.01
20.	Iron as Fe	mg/l	0.030
21.	Copper as Cu	mg/l	<0.01
22.	Arsenic as As	mg/l	<0.01
23.	Selenium	mg/l	<0.01
24.	Cadmium as cd	mg/l	<0.01
25.	Boron as B	mg/l	<0.01
26.	Mercury as Mg	mg/l	<0.001
27.	Lead as Pb	mg/l	<0.01
28.	Silica as SiO_2	mg/l	3.7
29.	Manganese as Mn	mg/l	<0.01
30.	Total coliforms	(MPN/100 ml)	Absent

TABLE 3.4.11			
GROUND WATER QUALITY ANALYSIS			
Station: **Pochampalli**			Month: **December, 2016**
S. NO.	**PARAMETER**	**UNIT**	**SAMPLE**
	PHYSICAL CHARACTERISTICS		
1.	Colour	Hazen	-----
2.	pH	--	7.3
3.	Turbidity	NTU	1.2
4.	Electrical Conductivity	ms/cm	647
5.	Total Dissolved Solids	mg/l	426
	CHEMICAL CHARACTERISTICS		
6.	Total Hardness	mg/l	195
7.	Calcium Hardness	mg/l	110
8.	Magnesium Hardness	mg/l	85
9.	Alkalinity	mg/l	145
10.	Sulphates	mg/l	82
11.	Chlorides	mg/l	61
12.	Nitrates as NO_3	mg/l	2.3
13.	Fluoride as F	mg/l	0.54
14.	Sodium as Na	mg/l	37
15.	COD	mg/l	4
16.	Residual chlorine	mg/l	<0.01
17.	Cyanides as CN^-	mg/l	<0.01
18.	Phenols as C_6H_5OH	mg/l	Absent
19.	Hexavalent chromium as Cr	mg/l	<0.01
20.	Iron as Fe	mg/l	0.024
21.	Copper as Cu	mg/l	<0.01
22.	Arsenic as As	mg/l	<0.01
23.	Selenium	mg/l	<0.01
24.	Cadmium as cd	mg/l	<0.01
25.	Boron as B	mg/l	<0.01
26.	Mercury as Mg	mg/l	<0.001
27.	Lead as Pb	mg/l	<0.01
28.	Silica as SiO_2	mg/l	3.3
29.	Manganese as Mn	mg/l	<0.01
30.	Total coliforms	(MPN/100 ml)	Absent

TABLE 3.4.12			
GROUND WATER QUALITY ANALYSIS			
Station : **Chandarlapadu**			Month: **December, 2016**
S. NO.	**PARAMETER**	**UNIT**	**SAMPLE**
	PHYSICAL CHARACTERISTICS		
1.	Colour	Hazen	-----
2.	pH	--	7.7
3.	Turbidity	NTU	2.0
4.	Electrical Conductivity	ms/cm	702
5.	Total Dissolved Solids	mg/l	469
	CHEMICAL CHARACTERISTICS		
6.	Total Hardness	mg/l	235
7.	Calcium Hardness	mg/l	139
8.	Magnesium Hardness	mg/l	96
9.	Alkalinity	mg/l	142
10.	Sulphates	mg/l	78
11.	Chlorides	mg/l	59
12.	Nitrates as NO_3	mg/l	2.9
13.	Fluoride as F	mg/l	0.52
14.	Sodium as Na	mg/l	42
15.	COD	mg/l	4
16.	Residual chlorine	mg/l	<0.01
17.	Cyanides as CN^-	mg/l	<0.01
18.	Phenols as C_6H_5OH	mg/l	Absent
19.	Hexavalent chromium as Cr	mg/l	<0.01
20.	Iron as Fe	mg/l	0.021
21.	Copper as Cu	mg/l	<0.01
22.	Arsenic as As	mg/l	<0.01
23.	Selenium	mg/l	<0.01
24.	Cadmium as cd	mg/l	<0.01
25.	Boron as B	mg/l	<0.01
26.	Mercury as Mg	mg/l	<0.001
27.	Lead as Pb	mg/l	<0.01
28.	Silica as SiO_2	mg/l	3.2
29.	Manganese as Mn	mg/l	<0.01
30.	Total coliforms	(MPN/100 ml)	Absent

3.5 LAND ENVIRONMENT

3.5.1 HYDROGEOLOGY OF THE DISTRICT: [GENERIC TOR # 4 x]

The district is underlain by variety of geological formations comprising from the oldest Archaeans to Recent Alluvium. Hydrogeologically these formations are classified as consolidated (Hard), semi-consolidated (Soft) and unconsolidated (Soft) formations. The consolidated formations include crystallines (khondalites, charnockites and granitic gneisses) and metasediments (Limestones, shales, phyllites and quartzites) of Archaean and Pre-cambrian periods respectively. The semi consolidated formations are represented by Tertiary formations (Rajahmundry & Gollapalli sandstones) and unconsolidated formations comprise deltaic alluvial deposits of Quaternary period. Prominent lineaments are trending in NE-SW, NW-SE and NNE-SSW direction. Consolidated formations occur in the northern part of the district. Among consolidated formations occurrence of metasediments is restricted to NW part of the district i.e., in parts of Jaggayyapeta, Penuganchiprolu, Nandigama and Chandralapadu mandals. Semiconsolidated formations occur in the northeastern part of the district and its extension is limited to small area i.e., in parts of Musunuru, Nuzividu, Bapulapadu and Gannavaram mandals. Unconsolidated formations occur in the southern part of the district i.e., in the delta area. Ground water occurs in all most all geological formations and its potential depends upon the nature of geological formations, geographical setup, incidence of rainfall, recharge and other hydrogeological characters of the aquifer.

Water Level Scenario

The depth to water level during pre monsoon season (May, 2011) in the district ranges between <2 and 10 m bgl. Water levels more than 5 m bgl occur in the parts of Gannavaram, Jagayyapet, Reddygudem, Visannapeta and Tiruvuru mandals. Whereas, water levels less than 2 m bgl occur in the coastal areas and eastern part of the district i.e. in the parts of Movva Ghantasala, Mipidevi, Challapalli, Machilipatnam, Avanigadda, Koduru, Nagayalanka, and Gudivada, Nandivada, Mandavalli and Kaikaluru mandals. The depth to water level during post monsoon season (Nov, 2011) in the northern part of the district ranges between 2 and 5 mbgl, whereas in the deltaic area water levels are generally less than 2 mbgl. As per the ground water resources of the district all the mandals fall under Safe category, except Musunuru and Nuzividu **(over-exploited mandals).**

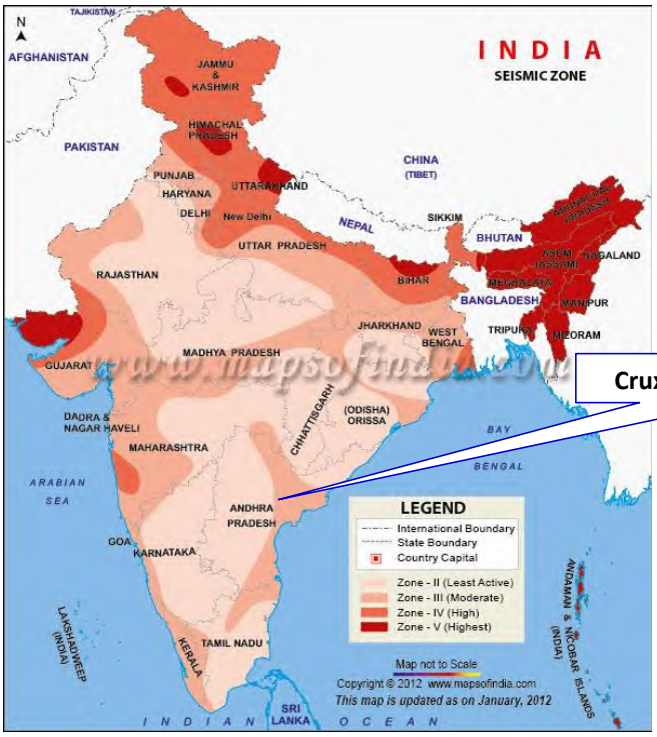
Source: CGWB report

3.5.2 MINERAL RESERVES

There are no mineral reserves in the plant area.

3.5.3 SEISMIC EFFECT

The plant site falls in **zone-III** (moderate) of seismic zone classification of India.



3.5.4 LAND USE PATTERN [GENERIC TOR # 4 viii]

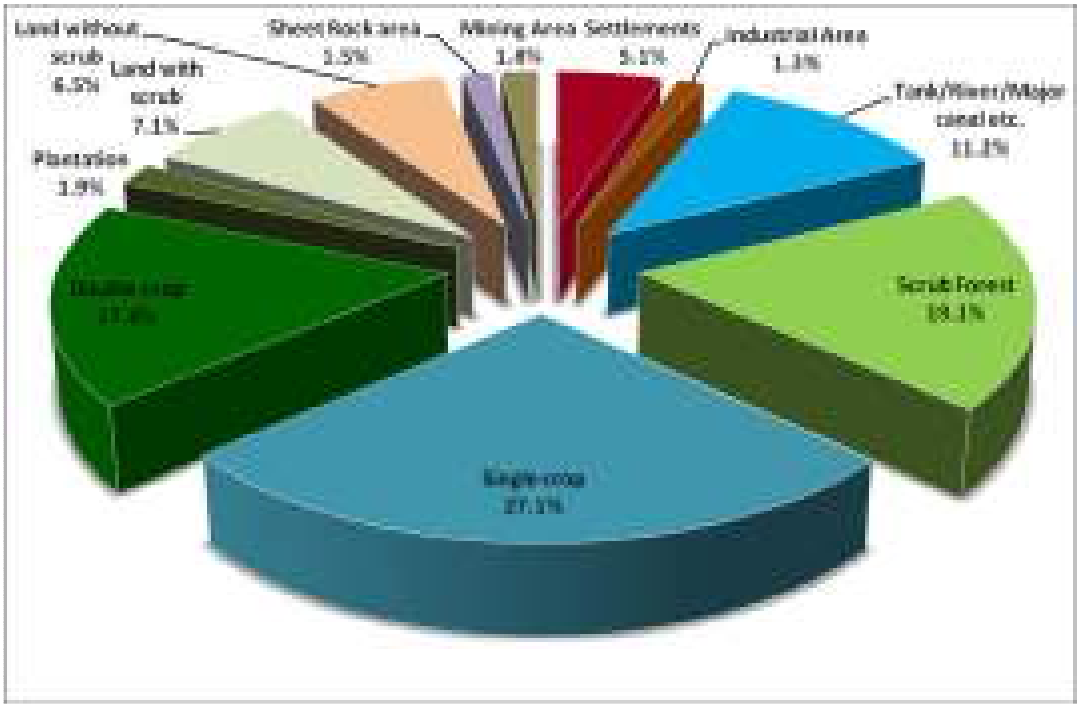
The following is the land use pattern within 10 Km. radius of the plant is shown in table 3.51.

TABLE 3.5.1

LAND USE CLASSIFICATION OF STUDY AREA

Sl. No.	LAND USE	Area in (Sq. km)	Area in %
1.	**BUILT-UP LAND**		
	A. Settlements	16.014	5.1
	B. Industrial area	4.082	1.3
2.	**WATERBODIES**		

	A. Tank/River/Major canal etc.	35.168	11.2
3.	**FOREST**		
	A. Scrub forest	59.974	19.1
4.	**CROP LAND**		
	A. Single crop	85.094	27.1
	B. Double crop	54.636	17.4
	C. Plantation	5.966	1.9
5.	**WASTELANDS**		
	A. Land with scrub	22.294	7.1
	B. Land without scrub	20.41	6.5
	C. Sheet rock area	4.71	1.5
	D. Mining area	5.652	1.8
	TOTAL	**314**	**100**



Land use and land cover based on satellite imagery is shown as Annexure - 6**. [GENERIC TOR # 5 ii]**

3.5.5 SOIL: [GENERIC TOR # 6 viii]

Eight no. of soil samples were collected and for analyzed for various parameters like texture, infiltration rate, bulk density, pH, Ca, Mg, Na, K, Zn, Mn etc. during December 2016. The Soil samples are taken from depth of 0 -15 cm will be collected. The physio-chemical characteristics of soil were analyzed using standard methods. Selection of sampling locations will be generally done based on the following factors:

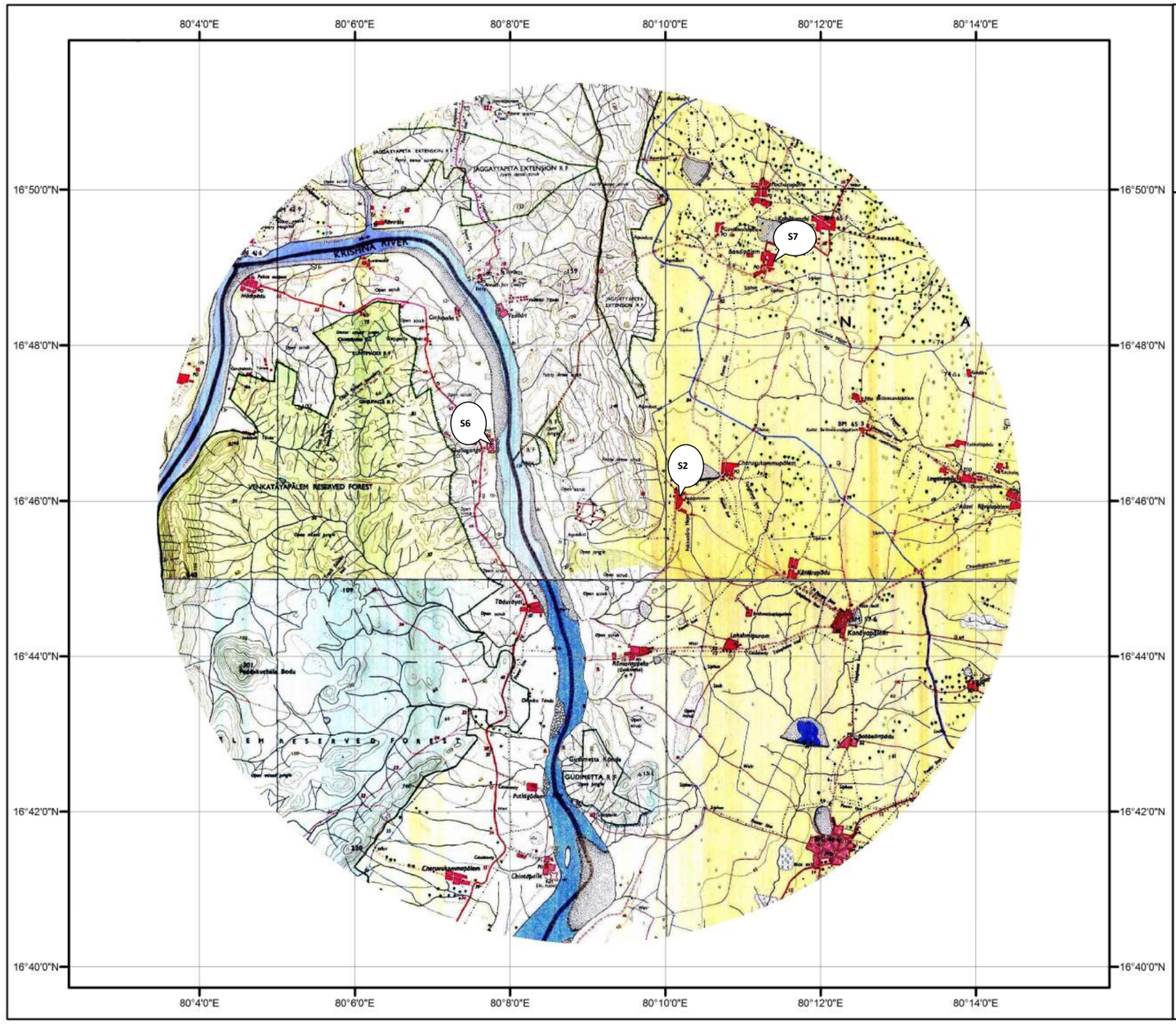
- Representation of plant site.
- Industrial Areas
- Residential areas
- Agricultural Activity
- Proximity to the Forest
- Proximity to Water body

The soil sampling locations and their distances from the plant were shown in Table 3.5.2. The soil quality sampling stations are shown in fig. 3.4. The soil characteristics were shown in Table Nos. 3.5.3. to 3.5.10.

TABLE 3.5.2

SOIL QUALITY SAMPLING STATIONS

S.NO	STATION	DIRECTION w.r.t to Site	DISTANCE IN KMS. w.r.t to Site	CRITERIA FOR SELECTION
1.	Plant Site	-----	-----	Represents the Project Site
2.	Peddavaram	E	1.8	Represents the Nearest habitation & Agricultural Activity
3.	Lakshmipuram	SE	4.0	Representing Residential area
4.	Rammanapeta	S	3.1	Representing Residential area
5.	Toduvayai	SW	2.8	Proximity to Water body (River)
6.	Challagariga	NW	2.9	Proximity to the Forest
7.	Bandipalem	NE	6.2	Proximity to Water body (Canal)
8.	Chandarlapadu	SSE	8.9	Representing Agricultural Activity



10 Km RADIUS TOPO MAP SHOWING SITE SURROUNDINGS

N

1 0.5 0 1 2 3 4 Kilometers

1 centimeter = 1,163 meters

LEGEND

PLANT SITE BOUNDARY

CONVENTIONAL SYMBOLS

SOIL QUALITY MONITORING STATIONS S

FIGURE - 3.4

TABLE- 3.5.3			
SOIL CHARACTERSTICS			
Station: **Plant Site**		Month: **December, 2016**	
S.NO.	**PARAMETER**	**UNIT**	**VALUE**
1.	Bulk Density	g/cc	1.6
2.	Infiltration rate	cm/hr	1.9
3.	pH		7.5
4.	Soil type		clay sandy
5.	Calcium	mg/100 gm	958
6.	Magnesium	mg/100 gm	72
7.	Sodium	mg/100 gm	58
8.	Potassium	mg/100 gm	47
9.	Available Phosphorous as $P_2 O_5$	mg/100 gm	31
10.	Mn	mg/100 gm	< 0.001
11.	Zn	mg/100 gm	< 0.001
12.	Pb	mg/100 gm	< 0.001

TABLE- 3.5.4			
SOIL CHARACTERSTICS			
Station : **Peddavaram**		Month: **December, 2016**	
S.NO.	**PARAMETER**	**UNIT**	**VALUE**
1.	Bulk Density	g/cc	1.5
2.	Infiltration rate	cm/hr	1.8
3.	pH		7.6
4.	Soil type		clay sandy
5.	Calcium	mg/100 gm	957
6.	Magnesium	mg/100 gm	78
7.	Sodium	mg/100 gm	51
8.	Potassium	mg/100 gm	45
9.	Available Phosphorous as $P_2 O_5$	mg/100 gm	25
10.	Mn	mg/100 gm	<0.001
11.	Zn	mg/100 gm	<0.001
12.	Pb	mg/100 gm	<0.001

TABLE - 3.5.5			
SOIL CHARACTERISTICS			
Station: **Lakshmipuram**			Month: **December, 2016**
S.NO.	**PARAMETER**	**UNIT**	**VALUE**
1.	Bulk Density	g/cc	1.6
2.	Infiltration rate	Cm/hr	1.8
3.	pH		7.5
4.	Soil type		clay sandy
5.	Calcium	mg/100 gm	941
6.	Magnesium	mg/100 gm	68
7.	Sodium	mg/100 gm	54
8.	Potassium	mg/100 gm	42
9.	Available Phosphorous as $P_2 O_5$	mg/100 gm	26
10.	Mn	mg/100 gm	<0.001
11.	Zn	mg/100 gm	<0.001
12.	Pb	mg/100 gm	<0.001

TABLE- 3.5.6			
SOIL CHARACTERISTICS			
Station: **Ramannapeta**			Month: **December, 2016**
S.NO.	**PARAMETER**	**UNIT**	**Value**
1.	Bulk Density	g/cc	1.6
2.	Infiltration rate	cm/hr	1.7
3.	pH		7.6
4.	Soil type		clay sandy
5.	Calcium	mg/100 gm	937
6.	Magnesium	mg/100 gm	70
7.	Sodium	mg/100 gm	58
8.	Potassium	mg/100 gm	41
9.	Available Phosphorous as $P_2 O_5$	mg/100 gm	29
10.	Mn	mg/100 gm	<0.001
11.	Zn	mg/100 gm	<0.001
12.	Pb	mg/100 gm	<0.001

TABLE- 3.5.7			
SOIL CHARACTERISTICS			
Station: **Toduvayai**		Month: **December, 2016**	
S.NO.	**PARAMETER**	**UNIT**	**VALUE**
1.	Bulk Density	g/cc	1.9
2.	Infiltration rate	cm/hr	1.5
3.	pH		7.2
4.	Soil type		clay sandy
5.	Calcium	mg/100 gm	977
6.	Magnesium	mg/100 gm	74
7.	Sodium	mg/100 gm	52
8.	Potassium	mg/100 gm	40
9.	Available Phosphorous as $P_2 O_5$	mg/100 gm	32
10.	Mn	mg/100 gm	<0.001
11.	Zn	mg/100 gm	<0.001
12.	Pb	mg/100 gm	<0.001

TABLE- 3.5.8			
SOIL CHARACTERISTICS			
Station: **Challagariga**		Month: **December, 2016**	
S.NO.	**PARAMETER**	**UNIT**	**VALUE**
1.	Bulk Density	g/cc	1.9
2.	Infiltration rate	cm/hr	1.8
3.	pH		7.8
4.	Soil type		clay sandy
5.	Calcium	mg/100 gm	1003
6.	Magnesium	mg/100 gm	85
7.	Sodium	mg/100 gm	53
8.	Potassium	mg/100 gm	36
9.	Available Phosphorous as $P_2 O_5$	mg/100 gm	26
10.	Mn	mg/100 gm	<0.001
11.	Zn	mg/100 gm	<0.001
12.	Pb	mg/100 gm	<0.001

TABLE- 3.5.9			
SOIL CHARACTERISTICS			
Station: **Bandipalem**		Month: **December, 2016**	
S.NO.	**PARAMETER**	**UNIT**	**VALUE**
1.	Bulk Density	g/cc	2.0
2.	Infiltration rate	cm/hr	1.7
3.	pH		7.6
4.	Soil type		clay sandy
5.	Calcium	mg/100 gm	1014
6.	Magnesium	mg/100 gm	99
7.	Sodium	mg/100 gm	63
8.	Potassium	mg/100 gm	52
9.	Available Phosphorous as $P_2 O_5$	mg/100 gm	34
10.	Mn	mg/100 gm	<0.001
11.	Zn	mg/100 gm	<0.001
12.	Pb	mg/100 gm	<0.001

TABLE- 3.5.10			
SOIL CHARACTERISTICS			
Station: **Chandarlapadu**		Month: **December, 2016**	
S.NO.	**PARAMETER**	**UNIT**	**VALUE**
1.	Bulk Density	g/cc	1.9
2.	Infiltration rate	cm/hr	1.4
3.	pH		7.6
4.	Soil type		clay sandy
5.	Calcium	mg/100 gm	993
6.	Magnesium	mg/100 gm	88
7.	Sodium	mg/100 gm	67
8.	Potassium	mg/100 gm	49
9.	Available Phosphorous as $P_2 O_5$	mg/100 gm	33
10.	Mn	mg/100 gm	<0.001
11.	Zn	mg/100 gm	<0.001
12.	Pb	mg/100 gm	<0.001

3.6 BIOLOGICAL ENVIRONMENT: [GENERIC TOR # 6 x]

INTRODUCTION:

The Convention on Biological Diversity (CBD), the Ramsar Convention, and the Convention on Migratory Species (CMS) recognize Environmental Impact Assessment (EIA) as an important decision making tool to help plan and implement development with biodiversity "in mind." The Conventions require Signatories ("Parties") to apply EIA to proposals with potential negative impacts on biodiversity to help meet their objectives, so that development proposals respect mechanisms for the conservation of biodiversity, result in sustainable use of biodiversity resources, and ensure fair and equitable sharing of the benefits arising from use of biodiversity. According to the International Association for Impact Assessment (IAIA), Impact Assessment provides opportunities to ensure that biodiversity values are recognized and taken into account in decision-making. Importantly, this involves a participatory approach with people who might be affected by a proposal.

The main aim of Conservation of Biodiversity is to ensure "No Net Loss". The biodiversity-related Conventions are based on the premise that further loss of biodiversity is unacceptable. Biodiversity must be conserved to ensure it survives, continuing to provide services, values and benefits for current and future generations. The following approach has been chosen by the IAIA to help achieve '*no net loss'* of biodiversity:

1. Avoidance of irreversible loss of biodiversity.
2. Seeking alternative solutions to minimize biodiversity losses.
3. Use of mitigation to restore biodiversity resources.
4. Compensation for unavoidable loss by providing substitutes of at least similar biodiversity value.
5. Looking for opportunities for enhancement.

This approach can be called "positive planning for biodiversity." It helps achieve no net loss by ensuring the safety and survival of rare or endangered or endemic or threatened (REET) species. This approach has been adopted in the study under report.

STUDY AREA:

Actual area of the plant site is described hereafter as the core area and the area surrounding the core area up to a radius of 10 Km. is referred to as the Buffer zone. The flora and fauna of the plant site (core area) and its environs up to a radius of 10 Km. was surveyed during the December, 2016.

TERRESTRIAL FLORA OF THE BUFFER AREA:

There are no sensitive ecosystems like the Sanctuaries or National Parks or Biosphere reserves or other protected areas around the core area in the buffer zone. The core area and its environs are subjected to biotic, anthropogenic pressures besides extensive mining and industrial activity.

The area around the plant site is colonized by mainly by *Prosopis juliflora, Alhagi camelorum*, *Carissa spinarum, Calotropis procera, Calotropis gigantea, Lantana camara, Strebulus asper, Alangium salvifolium, Breynia retusa, Terenna asiatinca Acacia leucophloea, Acacia sundra, Ziziphus numularia, Albizia lebbeck, Breynia vitis-idaea, Vitex negundo, Cassia auriculata, Cassia fistula, Cassia siamea, Diospyros chloroxylon, Jatropha curcas, Maytenus emarinata, Randia dumatorium, Randia uliginosa , Barleria prionitis* and others.

There are a few patches of open to thick scrub forests. These forests are supporting thick green cover but the vegetation is mostly a thick scrub forest. The forests are severely over grazed by the local livestock and the woody biomass is frequently harvested illegally for firewood. The most common perennial trees of the buffer area is represented by *Acacia catechu, Carissa spinarum, Maytenus emerginata, Ailanthus excelsa, Chloroxylon swietenia*, *Bauhinia racemosa*, *Anogeissus latifoloia, Butea monosperma, Butea superba, Grewia tillifolia, Grewia bracteata, Grewia hirsuta, Holoptelia integrifolia, Annona squamosa, Wrightia tinctoria, Mundulea suberosa, Butea monosperma, Randia dumeratorum, Ziziphus numulria, Prosopis juliflora, Acacia chundra, Terenna asiatica* and others.

FOREST VEGETATION OF THE BUFFER ZONE:

As per H.G. Champion's (1967) classification of the forest types of India, these forests come under the dry deciduous and thorny scrub types. There are a few patches of riverine forests along the banks of River Krishna. Relatively thick scrub forests, avenue plantations, agro forests and orchards

account for most of the tree species of the area. *Carissa spinarum, Lantana camara, Acacia catechu, Acacia nilotica, Acacia leucocephala, Acacia holosericea, Ziziphus marutiana, Ziziphus numularia, Maytenus emerginata, Calotropis procera, Calotropis gigantea* were the most abundant and predominant wild shrubs of the area. *Ficus benghalensis, Ficus religiosa, Cassia fistula, Peltophorum pterocarpum, Cassia siamea, Cassia spectabilis, Azadirachta indica, Holoptelia integrifolia, Tamarindus indica, Acacia nilotica, Acacia auriculiformis, Syzigium cumini, Delonix regia, Alstonia scholaris, Terminalia catappa* etc were the most common avenue trees. Owing to differences in land use and land cover pattern; variations in topography; differences in the frequency and intensity of biotic pressure, large variations in the vegetation cover of the buffer area could be noticed. But in general, the whole area was dominated by both palatable and nonpalatable weeds as well as perennial shrubs. Trees were confined mainly to the roadsides, and homesteads. Thorny shrubs belonging to the genera of *Acacia, Prosopis* and *Ziziphus* as well as *Vitex negundo*, *Annona squamosa, Cassia auriculata* etc were very abundant in the thick as well as the open scrub communities.

Among the weeds, *Parthenium hysterophorus, Hyptis suaveolens, Senna uniflora, Cassia occidentalis, Cassia tora, Amaranthus spinosus, Croton bonplnadianum, Abutilon indicum, Datura stramonium, Heliotropium indicum, Ocimum canum, Abutilon indicum, Acalypha indica* etc were prominent and abundant. Several species of forbs, grasses and sedges were also present. There are a few plantations of *Phyllanthus emblica, Tamarindus indicus, Mangifera indica, Annona squamosa, Achrus sapota, Citrus aurantifolia and Psidium guajava* besides the agro forests of Subabul (*Leucaena leucocephala*) and the ITC clones of *Eucalyptus.* The main crops of the area include Cotton, Sorghum, Jowar, Chillies, Tomato, Brinjal, Red gram, Black gram, and Ground nut, Castor etc under rained conditions and paddy under irrigated conditions. *Adansonia digitata* of Malvaceae was the only rare species found in the buffer zone. There are no other rare or endangered or endemic or threatened (REET) species in the study area. A list of trees and shrubs occurring in the buffer area during the period of survey is given in Table Below.

List of trees and shrubs encountered in the buffer zone of the study area.		
Botanical name	Family	Vegetation type
Acacia farnesiana	Mimosaceae	Deciduous forests
Acacia catechu	Mimosaceae	Deciduous forests
Acacia leucophloea	Mimosaceae	Deciduous forests
Acacia nilotica	Mimosaceae	Naturalized
Acacia tomentosa	Mimosaceae	Deciduous forests
Acacia torta	Mimosaceae	Thorn forests
Adansonia digitata	Malvaceae	Only four avenue trees
Aegle marmelos	Rutaceae	Cultivated and in forests
Ailanthus excelsa	Simaroubaceae	Cultivated & in forests
Alangium chinense	Alangiaceae	Thorn scrub
Alangium hexapetalum	Alangiaceae	Thorn scrub
Alangium salvifolium	Alangiaceae	Thorn scrub
Albizia procera	Mimosaceae	Deciduous forests
Albizia amara	Mimosaceae	Deciduous forests
Albizia lebbeck	Mimosaceae	Deciduous forests
Alstonia scholaris	Apocynaceae	Forests & avenue
Anacardium occidentale	Anacardiaceae	Cultivated
Anthocephalus chinensis	Rubiaceae	Avenue tree
Azadirachta indica	Meliaceae	Naturalized
Azima tetracantha	Salvadoraceae	Thorn forests
Barleria prionitis	Acanthaceae	Thorn scrub
Bauhinia purpurea	Caesalpiniaceae	Deciduous forests
Bauhinia racemosa	Caesalpiniaceae	Deciduous forests
Bauhinia tomentosa	Caesalpiniaceae	Deciduous forests
Bauhinia variegata	Caesalpiniaceae	Deciduous forests
Benkera malabarica	Rubiaceae	Deciduous forests
Borassus flabellifer	Arecaeae	Deciduous / thorn forests
Boswellia serrata	Burseraceae	Deciduous forests
Breynia vitis-idaea	Euphorbiaceae	Deciduous forests
Bridelia retusa	Euphorbiaceae	Deciduous forests
Buchanania lanzan	Anacardiaceae	Deciduous forests
Butea monosperma	Papilionaceae	Disturbed forests & wastelands
Cadaba fruticosa	Capparaceae	Thorn forest & hedges
Caesalpinia pulcherrima	Caesalpiniaceae	Naturalized
Canthium parviflorum	Rubiaceae	Thorn forests
Capparis brevispina	Capparaceae	Thorn forest & hedges
Capparis divaricata	Capparaceae	Thorn forest & hedges
Cassia fistula	Caesalpiniaceae	Deciduous / thorn forests
Catunaregam spinosa	Rubiaceae	Thorn forests
Ceiba pentandra	Bombacaeae	Dry forests & cultivated

Ceriscoides turgida	Rubiaceae	Thorn forests
Cissus quadrangularis	Vitaceae	Very widespread climber
Cleistanthus collinus	Euphorbiaceae	Deciduous forests
Clerodedron phlomides	Verbenaceae	Hedge plant
Commiphora caudata	Burseraceae	Deciduous forests
Cordia dichotoma	Cordiaceae	Deciduous forests
Crateva magna	Capparaceae	River banks
Delonix regia	Caesalpiniaceae	Naturalized
Delonix elata	Caesalpiniaceae	Naturalized
Dendrocalamus strictus	Poaceae	Deciduous forests
Diospyros chloroxylon	Ebenaceae	Thorn forests
Dodonaea viscosa	Sapindaceae	Open scrub forests
Dolichandrone falcata	Bignoniaceae	Deciduous forests
Erythrina suberosa	Papilionaceae	Deciduous forests
Erythrina variegata	Papilionaceae	Cultivated
Euphorbia antiquorum	Euphorbiaceae	Deciduous forests
Euphorbia tirucalli	Euphorbiaceae	Deciduous forests
Ficus benghalensis	Moraceae	Deciduous forests
Ficus religiosa	Moraceae	Deciduous forests
Gardenia gummifera	Rubiaceae	Deciduous forest
Gardenia latifolia	Rubiaceae	Deciduous forest
Gardenia resinifera	Rubiaceae	Deciduous forest
Gmelina arborea	Verbenaceae	Moist Deciduous forests
Hardwickia binata	Caesalpiniaceae	Deciduous forests
Holoptelia integrifolia	Ulmaceae	Deciduous forests
Ixora arborea	Rubiaceae	Deciduous forest
Jatropha curcas	Euphorbiaceae	Hedge
Lawsonia inermis	Lythraceae	Naturalized
Leucaena leucocephala	Mimosaceae	Naturalized
Mangifera indica	Anacardiaceae	Deciduous forests / Cultivated
Maytenus emerginata	Celastraceae	Thorn forest & hedges
Melia azedarach	Meliaceae	Naturalized
Michelia champaca	Magnoliaceae	Naturalized
Miliusa velutina	Anacardiaceae	Deciduous forests
Millingtoina hortensis	Bignoniaceae	Naturalized
Mimusops elengi	Sapotaceae	Deciduous forests
Morinda pubescens	Rubiaceae	Deciduous forest
Moringa perigosperma	Moringaceae	Naturalized
Mundelia suberosa	Fabaceae	Deciduous forests
Murraya koenigii	Rutaceae	Cultivated and in forests
Nyctanthes arbor-tristis	Nyctanthaceae	Naturalized
Pavetta indica	Rubiaceae	Deciduous forest
Phoenix robusta	Arecaeae	Deciduous / thorn forests

Phoenix sylvestris	Arecaeae	Deciduous / thorn forests
Phyllanthus emblica	Euphorbiaceae	Naturalized
Phyllanthus reticulatus	Euphorbiaceae	Deciduous forests
Pithecellobium dulce	Mimosaceae	Naturalized
Polyalthia cerasoides	Anacardiaceae	Deciduous forests
Pongamia pinnata	Papilionaceae	Naturalized
Prosopis cineria	Mimosaceae	Thorn forests
Prosopis juliflora	Mimosaceae	Thorn forests
Securinega leucopyrus	Euphorbiaceae	Deciduous forests
Securinega virosa	Euphorbiaceae	Thorn forests
Strebulus asper	Moraceae	Moist river/ road sides
Syzygium cumini	Myrtaceae	Naturalized
Tamarindus indica	Caesalpiniaceae	Naturalized
Tectona grandis	Verbenaceae	Deciduous forests & cultivated
Terenna asiatica	Rubiaceae	Thorn forest
Terminalia catappa	Combretaceae	Naturalized
Thespecia populnea	Malvaceae	Naturalized
Toddalia asiatica	Rutaceae	Deciduous forests
Vitex altissima	Verbenaceae	Deciduous forests
Vitex negundo	Verbenaceae	Hedges & road sides.
Vitex trifolia	Verbenaceae	Moist Deciduous forests
Wrightia arborea	Apocynaceae	Deciduous forests
Wrightia tinctoria	Apocynaceae	Deciduous / thorn forests
Xylia xylocarpa	Mimosaceae	Deciduous forests
Ziziphus marutiana	Rhamnaceae	Thorn forests
Ziziphus oenoplia	Rhamnaceae	Thorn forests
Ziziphus rugosa	Rhamnaceae	Thorn forests
Ziziphus xylopyrus	Rhamnaceae	Thorn forests

TERRESTRIAL FAUNA OF THE CORE AND ITS BUFFER ZONE:

Faunal diversity and species inventory of rare and elusive species was species was based on the following:

i. Direct observations during field visits.

ii. Circumstantial evidence based on pug marks, excreta, droppings, feathers, nests and the habitat features.

iii. Based on the reports from locals especially the Sheppards.

iv. Published literature including the reports, records and working plans of the forest department.

Special efforts have been made to trace and find whatever wild animals were present in the core area and the buffer area. As the chances of migrations between the core area and the surrounding buffer area are high, a common list of vertebrates either noticed or reported from the area up to 10 Km. radius are given in Table below. Other than those that are associated with human environment, other mammals were rarely seen. Rats, Mice, Bandicoots, Mongoose, Monkeys and Squirrels were sighted on a few occasions. Among the list of endangered Mammals, *Herpestes palustris* (Bengal Mongoose) was not spotted but another vulnerable species of Mongoose, *Herpestes fuscus* (Indian Brown Mongoose) was seen close to residential areas. The rest are seen quite frequently or reported by the locals or by the forest department. With the probable exception of rodents and bats, the rest of the mammals may not be residents of the area. They could just be casual visitors in search for food or mate. There were no hiding places or breeding grounds of wild mammals other than rhesus monkeys.

Among the reptiles, lizards and garden lizards were very common. *Varanus bengalensis (*Common Indian Monitor) was the only uncommon and Endangered species seen in the croplands.

Although there are eye witnesses to the presence of other snakes including Cobra, the survey teams did not encounter any other snake except a rat snake. But the presence of different snakes was indicated by the presence of dead skin shed by ecdysis. Among the reptiles, wall lizards, Garden lizards, and rat snakes were sighted during the survey. Amphibians except toads were relatively rare probably on account of dry conditions.

A list of birds either spotted or reported from the surroundings of the core area is presented in Table below. The resident birds were probably represented by Crows, Parrots, Doves, Mynas, Indian Robin, Swifts and Weaver birds. The rest may be described as vagrant birds. Resting birds and those in flight were photographed and identified by comparing with the data base on Indian birds. Only Crows, Parrots, Doves, Mynas, Indian Robin, swifts and weaver birds were more common among birds. *Passer domesticus* (House sparrow) was seen in the villages with thatched houses. There are no ecologically sensitive areas such as Sanctuaries, National Parks or biosphere reserves within the study area.

List of vertebrate species either seen or reported to occur in and around the core area.		
Mammals		
Common name	**Latin name**	**IUCN Status**
Fox	*Vulpes bengalensis*	Least Concern
Hare	*Lepus nigricollis*	Least Concern
Indian Brown Mongoose	*Herpestes fuscus*	Vulnerable
Jackal	*Canis aureus*	Least Concern
Three striped Squirrel	*Funambulus pennanti*	Least Concern
Lesser bandicoot Rat	*Bandicota bengalensis*	Least Concern
Greater Bandicoot Rat	*Bandicota indica*	Least Concern
Brown Rat	*Rattus rattus*	Least Concern
REPTILES		
Chameleon	Chameleon zeylanicus	Least Concern
Cobra	*Naja naja*	Least Concern
Common Indian Krait	*Bungarus caeruleus*	Least concern
Garden lizard	*Calotes versicolor*	Least Concern
Giant Blind Snake	*Typhlops diardii*	Least Concern
Indian Day Gecko	*Cnemaspis indica*	Least Concern
Indian golden gecko	*Calodactylodes aureus*	Least Concern
Indian Rock Lizard	*Psammophilus dorsalis*	Least Concern
Indian star tortoise	*Geochelone elegans*	Least concern
Marbled tree gecko	*Hemidactylus leschenaultii*	Least Concern
Rat snake	*Ptyas mucosa / Tripidonatus pisactor*	Least concern
Russell's viper	*Vipera russseli*	Least concern
Sand boa	*Eryx johni*	Least concern
Saw scaled viper	*Echis carinatus*	Least concern
Slender Blind Snake	*Typhlops porrectus*	Least Concern
Indian wall lizard	*Hemidactylus flaviviridis*	Least Concern
Tree Snake	*Chrysopelea taprobanica*	Least Concern
Whip Snake	*Dryphis nasutus*	Least concern
AMPHIBIANS		
Indian Burrowing frog	*Sphaerotheca breviceps*	Least Concern
Common Indian Toad	*Bufo melonosticatus*	Least Concern
Tree Frog	*Hyla arboria*	Least Concern

Avian fauna of the MLAs and their buffer zone			
Common name	Latin name	Residential Status	IUCN red data status
Myna, common	*Acridothers trists*	Widespread	Least concern
Common kingfisher	*Alcedo atthis*	Common along the coast	Least concern

Common teal	*Anas crecca*	In a pond	Least concern
Spot-billed Duck	*Anas poecilorhyncha*	In all ponds	Least concern
Bar-headed goose	*Anser indicus*	In a Tank	Least concern
Swift, house	*Apus affinis*	Widespread	Least concern
Tawny Eagle	*Aquila rapax*	Along the coast	Least concern
Indian pond heron	*Ardeola grayii*	In a Tank	Least concern
Owl, spotted	*Athene brama*	Not seen during day time	Least concern
Common Raven	*Corvus corax*	Widespread	Least concern
Jungle crow	*Corvus macrohyuchos*	Very common	Least concern
House Crow	*Corvus splendens*	Widespread	Least concern
Indian cuckoo	*Cuculus micropterus*	Very common on Mango trees	Least concern
Common hawk	*Cuculus varus*	Common	Least concern
Lesser whistling-duck	*Dendrocygna javanica*	In a tank	Least concern
Wood pecker, Golden backed	*Dinopium bengalensis*	On avenue trees	Least concern
White-bellied woodpecker	*Dryocopus javensis*	On roadside avenue tree	Least concern
Egret, little	*Egretta garetta*	Widespread	
Asian koel	*Eudynamys scolopacea*	On mango trees	Least concern
Brown Falcon	*Falco berigora*	Frequent along the coast	Least concern
Partridge, grey	*Francolinus pondicerianus*	Spotted only once	Least concern
Painted spur fowl	*Galloperdix lunulata*	Seen only once on a rocky hill	Least concern
Barred jungle Owlet	*Galuciddum radiatuum,*	Not seen but reported	Least concern
White-Throated Kingfisher	*Halcyon smyrnensis*	Common along Pudimadaka coast	Least concern
Heart-spotted woodpecker	*Hemicircus canente*	On roadside avenue tree	Least concern
Common hawk cuckoo	*Hierococcyx varius*	Along the coast	Least concern
Swallow, common	*Hirando rustica,*	Widespread	Least concern
White-cheeked barbet	*Megalaima viridis*	In forest areas	Least concern
Brown-headed barbet	*Megalaima zeylanica*	In bushes	Least concern
Green bee-eater	*Merops orientalis*	Widespread	Least concern
Black kite / Pariah kite	*Milvus migrans*	Widespread	Least concern
Cotton pygmy-goose	*Nettapus coromandelianus*	In a pond	Least concern
House Sparrow	*Passer domesticus*	In all hamlets	Least concern
Jungle bush quail	*Perdicula asiatica*	Resident of scrub forest	Least concern
Cormorant	*Phalacrocorax higher*	Rare	Least concern
Village Weaver	*Ploceus cucullatus*	On Coconut trees	Least concern

Ibis, black	*Pseudibis papilosa*	Very rare	Least concern
Parakeet large Indian	*Psittacula eupatria*	Very common and widespread	Least concern
Rose-ringed parakeet	*Psittacula krameri*	Mango trees	Least concern
Duck, comb	*Sarkediornis melanothus*	In a Tank	Least concern
Indian robin	*Saxicoloides fulicata*	Very common	Least concern
Myna, Black-headed	*Sturnus pagodarun*	Very common	Least concern
Pigeon, common Green	*Treron pheoenicoptera*	Widespread	Least concern
Barred button quail	*Turnix suscitator*	In a pond	Least concern

AQUATIC ECOLOGY:

River Krishna runs along the western part of the Plant site in the buffer zone. As the flow in the river was very low, the moist river bed and banks were colonized by a few aquatic plants. The list of aquatic macrophytic plants found is given in Table below. There are no REET species. Similarly, a list of fishes caught or trapped by fisherman is given in Table below.

List of aquatic or semi aquatic plants found in and along the River Krishna		
Latin name	Family	Status
Acanthus ilicifolius	Acanthaceae	Locally dominant
Alternanthera philoxeroides	Solanaceae	Predominant occasionally
Aponogeton natans	Aponogetonaceae	Common
Azolla pinnata	Azollaceae	Scattered and common
Brachiaria mutica	Poaceae	Sporadic
Carex cruciata	Cyperaceae	Occasional
Centella asiatica	Apiaceae	In localized patches
Ceratophyllum demersum	Ceratophyllaceae	Scattered dense patches.
Chrysopogon aciculatus	Poaceae	Occasional
Colocassia esculenta	Araceae	Occasional
Cyperus exaltatus	Cyperaceae	Locally abundant
Cyperus pangorei	Cyperaceae	Scattered
Echinochloa colona	Poaceae	Occasional
Eichhornia crassipes	Pontederiaceae	Extensive and widespread
Hydrilla verticillata	Hydrocharitaceae	Prevalent
Ipomoea aquatica	Convolvulaceae	Extensive and widespread
Limnophila heterophylla	Scrophulariaceae	Common
Limnophila indica	Scrophulariaceae	Common
Ludwigia perennis	Onagraceae	Occasional
Marsilia quadrifoliata	Marsiliaceae	Very common Pteridophyte
Nechamandra alternifolia	Hydrocharitaceae	Sporadic
Nelumbo nucifera	Nelumbiaceae	Very common
Nymphaea nauchali	Nympheaceae	Widely scattered
Nymphaea stellata	Nympheaceae	Widely scattered

Nymphoides hydrophylla	Nympheaceae	Scattered
Nymphoides indica	Nympheaceae	Scattered
Ottelia alismoides	Hydrocharitaceace	Widely scattered
Oxalis corniculata	Oxalidaceae	Occasional
Paspalidium geminatum	Poaceae	Common
Phragmites karka	Cyperaceae	Occasional
Pistia stratoides	Araceae	Widespread
Salvinia auriculata	Salviniaceae	Widespread
Salvinia cucullata	Salviniaceae	Common
Salvinia cucullata	Salviniaceae	Occasional
Trapa natans	Trapaceae	Sporadic
Schoenoplectus articulatus	Cyperaceae	Occasional
Typha angustata	Typhaceae	Extensive and widespread
Vallisneria spiralis	Hydrocharitaceae	Widespread

List of Fishes caught in the area by fisherman from the Krishna River		
Common name	**Latin name**	**Use**
Catla	*Catla catla*	Edible
Rohu	*Labeo rohita*	Edible
Murrel	*Channa striatus*	Edible
Wallago	*Wallago attu*	Edible
Cat fish	*Mystus vittatus*	Edible
Spiny eel	*Mastecembalus armatus*	Edible
Giant prech	*Lates calcarifer*	Edible
Silonia	*Silonia silonia*	Skin & liver
Pearl spot	*Etroplus suratensis*	Skin & liver

3.7 SOCIO – ECONOMIC ASPECTS: [GENERIC TOR # 6 xi]

Baseline data are collected and prepared by our Team comprising of FAE & Team Members. The study area covers within a radius of 10 km from the Plant site. The 10 km radius study area around the plant site comprises of **28 villages.**

Studying socio-economic environment is necessary to identify the opinion of the Stake holders in the study area.

Discussions / study has been carried out in most of the villages located in all directions with reference to plant site by FGD (Focused Group Discussions) in each village starting with Sarpanch & then with Villagers. Socio economic survey has been conducted to ascertain the existing socioeconomic status to compare the same with the developments due to the plant.

Field Study with the help of Focussed Group Discussions

Initially a set of Questions in the form of a questionnaire has been prepared consisting of the following;

Population, House Holds, income, working conditions (Farmers, employment, self employment, etc.), Sanitation Facilities, Source of Drinking water, Availability of Water, Ground water table (past 5 years scenario), health of the People with specific reference to endemic diseases such as Maleria, Dengue etc, Power Availability, transportation and communication, education, environment and any pollution related problems being phased by the stake holders in the study area to evaluate the quality of life of that particular area and general attentiveness of the Villagers about the project.

Demographic characteristics of the study area falling within 10 km radius of the plant site have been compiled to assess the pre project socio economic status. Secondary data has been collected from various government agencies i.e., Census of India and other government departments of forestry, irrigation etc., and Mandal Development Offices of the relevant government departments. The following are the demographic details of the study area.

POPULATION BREAK UP AS PER CENSUS 2011

S.No.	Village Name	Total No. of House Holds	Total Population	Total males	Total females	Schedule Caste Population	Scheduled caste males	Scheduled caste Females	Schedule Tribe Population	Scheduled Tribe males	Scheduled Tribe Females
1.	Kothapalle	1603	5992	3041	2951	1339	685	654	561	292	269
2.	Madipadu Agraharam	382	1533	789	744	446	217	229	0	0	0
3.	Challagariga	336	1490	736	754	791	399	392	141	65	76
4.	Chintapalle	1250	4547	2272	2275	558	278	280	355	178	177
5.	Konduru	1014	4028	1998	2030	758	363	395	424	206	218
6.	Brahmanapalle (Part)	1134	4174	2081	2093	1073	529	544	153	73	80
7.	Kondayapalem	913	3501	1806	1695	774	407	367	99	47	52
8.	Takkellapadu	2249	7966	3898	4068	1654	800	854	401	196	205
9.	Chinapalem	997	3163	1621	1542	1010	529	481	88	42	46
10.	Upparapalem	1162	4291	2146	2145	971	491	480	133	68	65
11.	Boddulurupadu	313	1034	506	528	210	112	98	0	0	0
12.	Chandarlapadu	17586	60385	29852	30533	6632	3244	3388	2772	1369	1403
13.	Peddavaram	444	1381	703	678	300	157	143	3	1	2
14.	Gangadipalem	2632	9198	4682	4516	652	328	324	237	119	118
15.	Pochampalle	978	3798	1928	1870	1075	574	501	21	10	11
16.	Jayanthipuram	619	2348	1191	1157	520	269	251	1339	679	660
17.	Toduvayai	316	1275	626	649	465	233	232	0	0	0
18.	Bandipalem	1163	4568	2297	2271	1500	767	733	13	7	6
19.	Konakanchi	955	3372	1690	1682	922	469	453	61	31	30
20.	Nawabpeta	1401	4826	2372	2454	1281	648	633	80	36	44
21.	Lingalapadu	473	1901	961	940	608	311	297	78	33	45
22.	Adiviravulapadu	544	2101	1063	1038	929	469	460	106	53	53
23.	Somavaram	1139	4585	2342	2243	1070	547	523	10	6	4
24.	Konayapalem	1612	5965	2997	2968	1736	892	844	513	251	262

25.	Munagala Palle	332	1353	672	681	846	424	422	16	7	9
26.	Kasarabada	358	1288	664	624	357	198	159	42	20	22
27.	Laxmipuram	1557	5471	2741	2730	435	205	230	49	26	23
28.	Ramannapeta	246	785	376	409	152	67	85	0	0	0

LITERACY LEVELS OF THE POPULATION UP AS PER CENSUS 2011

S.No.	Village Name	Total population Literates	Male literates	Female literates	Total population illiterates	Male illiterates	Female illiterates
1.	Kothapalle	2639	1604	1035	3353	1437	1916
2.	Madipadu Agraharam	796	478	318	737	311	426
3.	Challagariga	636	375	261	854	361	493
4.	Chintapalle	2128	1311	817	2419	961	1458
5.	Konduru	1264	803	461	2764	1195	1569
6.	Brahmanapalle (Part)	2077	1269	808	2097	812	1285
7.	Kondayapalem	1614	998	616	1887	808	1079
8.	Takkellapadu	5205	2829	2376	2761	1069	1692
9.	Chinapalem	2036	1110	926	1127	511	616
10.	Upparapalem	2280	1262	1018	2011	884	1127
11.	Boddulurupadu	608	334	274	426	172	254
12.	Chandarlapadu	36795	19835	16960	23590	10017	13573
13.	Peddavaram	829	441	388	552	262	290
14.	Gangadipalem	4918	2771	2147	4280	1911	2369
15.	Pochampalle	1935	1139	796	1863	789	1074
16.	Jayanthipuram	1109	675	434	1239	516	723
17.	Toduvayai	583	319	264	692	307	385
18.	Bandipalem	2434	1388	1046	2134	909	1225
19.	Konakanchi	1966	1120	846	1406	570	836
20.	Nawabpeta	2578	1455	1123	2248	917	1331

21.	Lingalapadu	899	518	381	1002	443	559
22.	Adiviravulapadu	890	510	380	1211	553	658
23.	Somavaram	2312	1236	1076	2273	1106	1167
24.	Konayapalem	3092	1788	1304	2873	1209	1664
25.	Munagala Palle	913	488	425	440	184	256
26.	Kasarabada	562	352	210	726	312	414
27.	Laxmipuram	3416	1816	1600	2055	925	1130
28.	Ramannapeta	459	234	225	326	142	184

WORKERS CLASSIFICATION AS PER CENSUS 2011 (MAIN & MARGINAL)

S.No.	Village Name	TOTAL WORK_P	TOTAL WORK_M	TOTAL WORK_F	MAIN WORK_P	MAIN WORK_M	MAIN WORK_F	MARGINAL WORK_P	MARGINAL WORK_M	MARGINAL WORK_F
1.	Kothapalle	3590	1802	1788	3540	1796	1744	50	6	44
2.	Madipadu Agraharam	906	455	451	905	454	451	1	1	0
3.	Challagariga	903	465	438	750	456	294	153	9	144
4.	Chintapalle	2935	1478	1457	2900	1457	1443	35	21	14
5.	Konduru	2640	1309	1331	2634	1306	1328	6	3	3
6.	Brahmanapalle (Part)	2327	1268	1059	1802	1134	668	525	134	391
7.	Kondayapalem	1818	1042	776	1766	1011	755	52	31	21
8.	Takkellapadu	4067	2443	1624	3831	2379	1452	236	64	172
9.	Chinapalem	1684	993	691	1121	714	407	563	279	284
10.	Upparapalem	2513	1332	1181	1826	1191	635	687	141	546
11.	Boddulurupadu	651	329	322	516	310	206	135	19	116
12.	Chandarlapadu	30256	18034	12222	25018	16615	8403	5238	1419	3819
13.	Peddavaram	746	436	310	678	424	254	68	12	56
14.	Gangadipalem	4789	2809	1980	3713	2561	1152	1076	248	828
15.	Pochampalle	2236	1164	1072	2172	1137	1035	64	27	37
16.	Jayanthipuram	1230	635	595	736	471	265	494	164	330
17.	Toduvayai	775	395	380	518	373	145	257	22	235

18.	Bandipalem	2797	1438	1359	2478	1287	1191	319	151	168
19.	Konakanchi	1806	1023	783	1663	972	691	143	51	92
20.	Nawabpeta	2824	1453	1371	2747	1442	1305	77	11	66
21.	Lingalapadu	1088	600	488	1072	592	480	16	8	8
22.	Adiviravulapadu	1089	613	476	952	598	354	137	15	122
23.	Somavaram	2567	1449	1118	2326	1378	948	241	71	170
24.	Konayapalem	3429	1826	1603	3188	1770	1418	241	56	185
25.	Munagala Palle	737	388	349	652	351	301	85	37	48
26.	Kasarabada	749	391	358	743	387	356	6	4	2
27.	Laxmipuram	2492	1698	794	1542	1249	293	950	449	501
28.	Ramannapeta	474	258	216	473	257	216	1	1	0

CULTIVATORS CLASSIFICATION AS PER CENSUS 2011 (MAIN & MARGINAL)

S.No.	Village Name	MAIN_CL_P	MAIN_CL_M	MAIN_CL_F	MARG_CL_P	MARG_CL_M	MARG_CL_F
1.	Kothapalle	715	409	306	4	0	4
2.	Madipadu Agraharam	166	100	66	0	0	0
3.	Challagariga	101	95	6	2	0	2
4.	Chintapalle	543	322	221	1	1	0
5.	Konduru	17	14	3	0	0	0
6.	Brahmanapalle (Part)	267	171	96	5	2	3
7.	Kondayapalem	549	390	159	18	8	10
8.	Takkellapadu	506	421	85	25	8	17
9.	Chinapalem	70	66	4	19	12	7
10.	Upparapalem	634	531	103	15	3	12
11.	Boddulurupadu	10	9	1	2	0	2
12.	Chandarlapadu	3674	3163	511	100	64	36
13.	Peddavaram	139	134	5	7	2	5
14.	Gangadipalem	162	157	5	15	12	3

15.	Pochampalle	450	242	208	7	4	3
16.	Jayanthipuram	37	27	10	15	3	12
17.	Toduvayai	44	42	2	13	1	12
18.	Bandipalem	528	336	192	11	10	1
19.	Konakanchi	262	222	40	2	1	1
20.	Nawabpeta	313	207	106	7	1	6
21.	Lingalapadu	180	144	36	1	1	0
22.	Adiviravulapadu	133	129	4	23	2	21
23.	Somavaram	367	337	30	8	2	6
24.	Konayapalem	400	339	61	30	1	29
25.	Munagala Palle	54	50	4	1	0	1
26.	Kasarabada	36	19	17	3	1	2
27.	Laxmipuram	197	186	11	19	11	8
28.	Ramannapeta	82	71	11	1	1	0

NOTE:

MAIN CL P	**MAIN CULTIVATORS POPULATION**
MAIN CL M	**MAIN CULTIVATORS MALE**
MAIN CL F	**MAIN CULTIVATORS FEMALE**
MARG CL P	**MARGINAL CULTIVATORS POPULATION**
MARG CL M	**MARGINAL CULTIVATORS MALE**
MARG CL F	**MARGINAL CULTIVATORS FEMALE**

AGRICULTURAL LABOURS CLASSIFICATION AS PER CENSUS 2011 (MAIN & MARGINAL)

S.No.	Village Name	MAIN_AL_P	MAIN_AL_M	MAIN_AL_F	MARG_AL_P	MARG_AL_M	MARG_AL_F
1.	Kothapalle	2576	1203	1373	39	4	35
2.	Madipadu Agraharam	706	331	375	1	1	0
3.	Challagariga	604	324	280	150	8	142
4.	Chintapalle	2236	1048	1188	27	15	12
5.	Konduru	2542	1241	1301	3	2	1
6.	Brahmanapalle (Part)	1019	535	484	489	111	378
7.	Kondayapalem	1047	516	531	23	17	6
8.	Takkellapadu	1919	844	1075	172	25	147
9.	Chinapalem	770	418	352	471	212	259
10.	Upparapalem	942	488	454	668	135	533
11.	Boddulurupadu	450	254	196	120	12	108
12.	Chandarlapadu	13588	7609	5979	4444	1027	3417
13.	Peddavaram	477	247	230	36	8	28
14.	Gangadipalem	2115	1149	966	885	194	691
15.	Pochampalle	1587	795	792	46	17	29
16.	Jayanthipuram	416	199	217	458	144	314
17.	Toduvayai	288	164	124	226	15	211
18.	Bandipalem	1773	819	954	271	118	153
19.	Konakanchi	1039	461	578	111	36	75
20.	Nawabpeta	2114	1021	1093	45	8	37
21.	Lingalapadu	824	398	426	10	5	5
22.	Adiviravulapadu	765	426	339	101	9	92
23.	Somavaram	1546	774	772	207	56	151
24.	Konayapalem	2512	1211	1301	168	32	136
25.	Munagala Palle	536	247	289	79	34	45
26.	Kasarabada	643	316	327	0	0	0

27.	Laxmipuram	721	503	218	730	289	441
28.	Ramannapeta	360	161	199	0	0	0

NOTE:

MAIN AL P	**MAIN AGRICULTURAL LABOR POPULATION**
MAIN AL M	**MAIN AGRICULTURAL LABOR MALE**
MAIN AL F	**MAIN AGRICULTURAL LABOR FEMALE**
MARG AL P	**MARGINAL AGRICULTURAL LABOR POPULATION**
MARG AL M	**MARGINAL AGRICULTURAL LABOR MALE**
MARG AL F	**MARGINAL AGRICULTURAL LABOR FEMALE**

HOUSEHOLD INDUSTRY WORKERS CLASSIFICATION AS PER CENSUS 2011(MAIN & MARGINAL)

S.No.	Village Name	MAIN_HH_P	MAIN_HH_M	MAIN_HH_F	MARG_HH_P	MARG_HH_M	MARG_HH_F
1.	Kothapalle	16	8	8	1	1	0
2.	Madipadu Agraharam	1	0	1	0	0	0
3.	Challagariga	3	2	1	0	0	0
4.	Chintapalle	11	9	2	4	2	2
5.	Konduru	5	3	2	0	0	0
6.	Brahmanapalle (Part)	40	30	10	3	1	2
7.	Kondayapalem	0	0	0	0	0	0
8.	Takkellapadu	54	39	15	3	1	2
9.	Chinapalem	4	3	1	9	6	3
10.	Upparapalem	17	9	8	1	1	0
11.	Boddulurupadu	1	1	0	4	0	4
12.	Chandarlapadu	1106	643	463	186	59	127
13.	Peddavaram	5	3	2	12	0	12

14.	Gangadipalem	6	4	2	1	0	1
15.	Pochampalle	9	6	3	2	0	2
16.	Jayanthipuram	0	0	0	0	0	0
17.	Toduvayai	4	2	2	0	0	0
18.	Bandipalem	32	20	12	6	3	3
19.	Konakanchi	21	11	10	11	3	8
20.	Nawabpeta	26	7	19	1	0	1
21.	Lingalapadu	6	5	1	0	0	0
22.	Adiviravulapadu	4	3	1	1	0	1
23.	Somavaram	9	4	5	2	1	1
24.	Konayapalem	31	20	11	4	1	3
25.	Munagala Palle	0	0	0	0	0	0
26.	Kasarabada	2	1	1	0	0	0
27.	Laxmipuram	14	13	1	11	3	8
28.	Ramannapeta	0	0	0	0	0	0

NOTE:

MAIN HH P	**MAIN HOUSE HOLDERS POPULATION**
MAIN HH M	**MAIN HOUSE HOLDERS MALE**
MAIN HH F	**MAIN HOUSE HOLDERS FEMALE**
MARG HH P	**MARGINAL HOUSE HOLDERS POPULATION**
MARG HH M	**MARGINAL HOUSE HOLDERS MALE**
MARG HH F	**MARGINAL HOUSE HOLDERS FEMALE**

OTHER WORKERS CLASSIFICATION AS PER CENSUS 2011 (MAIN & MARGINAL)

S.No.	Village Name	MAIN_OT_P	MAIN_OT_M	MAIN_OT_F	MARG_OT_P	MARG_OT_M	MARG_OT_F
1.	Kothapalle	233	176	57	6	1	5
2.	Madipadu Agraharam	32	23	9	0	0	0
3.	Challagariga	42	35	7	1	1	0
4.	Chintapalle	110	78	32	3	3	0
5.	Konduru	70	48	22	3	1	2
6.	Brahmanapalle (Part)	476	398	78	28	20	8
7.	Kondayapalem	170	105	65	11	6	5
8.	Takkellapadu	1352	1075	277	36	30	6
9.	Chinapalem	277	227	50	64	49	15
10.	Upparapalem	233	163	70	3	2	1
11.	Boddulurupadu	55	46	9	9	7	2
12.	Chandarlapadu	6650	5200	1450	508	269	239
13.	Peddavaram	57	40	17	13	2	11
14.	Gangadipalem	1430	1251	179	175	42	133
15.	Pochampalle	126	94	32	9	6	3
16.	Jayanthipuram	283	245	38	21	17	4
17.	Toduvayai	182	165	17	18	6	12
18.	Bandipalem	145	112	33	31	20	11
19.	Konakanchi	341	278	63	19	11	8
20.	Nawabpeta	294	207	87	24	2	22
21.	Lingalapadu	62	45	17	5	2	3
22.	Adiviravulapadu	50	40	10	12	4	8
23.	Somavaram	404	263	141	24	12	12
24.	Konayapalem	245	200	45	39	22	17
25.	Munagala Palle	62	54	8	5	3	2
26.	Kasarabada	62	51	11	3	3	0
27.	Laxmipuram	610	547	63	190	146	44

28.	Ramannapeta	31	25	6	0	0	0

NOTE:

MAIN OT P	**MAIN OTHER WORKERS POPULATION**
MAIN OT M	**MAIN OTHER WORKERS MALE**
MAIN OT F	**MAIN OTHER WORKERS FEMALE**
MARG OT P	**MARGINAL OTHER WORKERS POPULATION**
MARG OT M	**MARGINAL OTHER WORKERS MALE**
MARG OT F	**MARGINAL OTHER WORKERS FEMALE**

NON WORKERS CLASSIFICATION AS PER CENSUS 2011

S.No.	Village Name	NON_WORK_P	NON_WORK_M	NON_WORK_F
1.	Kothapalle	2402	1239	1163
2.	Madipadu Agraharam	627	334	293
3.	Challagariga	587	271	316
4.	Chintapalle	1612	794	818
5.	Konduru	1388	689	699
6.	Brahmanapalle (Part)	1847	813	1034
7.	Kondayapalem	1683	764	919
8.	Takkellapadu	3899	1455	2444
9.	Chinapalem	1479	628	851
10.	Upparapalem	1778	814	964
11.	Boddulurupadu	383	177	206

12.	Chandarlapadu	30129	11818	18311
13.	Peddavaram	635	267	368
14.	Gangadipalem	4409	1873	2536
15.	Pochampalle	1562	764	798
16.	Jayanthipuram	1118	556	562
17.	Toduvayai	500	231	269
18.	Bandipalem	1771	859	912
19.	Konakanchi	1566	667	899
20.	Nawabpeta	2002	919	1083
21.	Lingalapadu	813	361	452
22.	Adiviravulapadu	1012	450	562
23.	Somavaram	2018	893	1125
24.	Konayapalem	2536	1171	1365
25.	Munagala Palle	616	284	332
26.	Kasarabada	539	273	266
27.	Laxmipuram	2979	1043	1936
28.	Ramannapeta	311	118	193

CHAPTER – 4
ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

4.1 INTRODUCTION

Impact prediction is a very important phenomenon in evaluating the environmentally potential adverse impacts for any proposed industrial activities. The impact prediction is always carried out under worst possible conditions so as to mitigate or to eliminate the environmental hazards. These predictions thus calculated are superimposed over the baseline data to know the quality of environment in the vicinity of the plant site so as to calculate the net impact on the environment after the commencement of production of enhancement capacity.

4.2 AIR ENVIRONMENT

Prediction of impacts is the most important component in the Environmental Impact Assessment studies. Several scientific techniques and methodologies are available to predict impacts of developmental activities on physico, ecological and socioeconomic environments. Such predictions are superimposed over the baseline status of environmental quality to derive the ultimate (post project) scenario of environmental conditions. The prediction of impacts helps to identify the environmental management plan required to be executed during and after commissioning the proposed expansion project activity to minimize the adverse impacts on environmental quality.

The mathematical models are the best tools to quantitatively describe cause-effect relationships between sources of pollution and different components of environment. In case, mathematical models are not available or it is not possible to identify / validate through models for particular situation, prediction could be arrived at through available scientific knowledge and judgments.

The mathematical model used for predictions in the present study include, steady state Gaussian Plume dispersion model designed for multiple point sources for air quality, Wave divergence and Federal Highway Administration (FHWA) models for noise levels. In case of water, land, biological

and socio-economic environments the predictions have been made based on available scientific knowledge and judgments.

4.2.1 IMPACT ON TOPOGRAPHY AND CLIMATE

4.2.1.1 IMPACT ON TOPOGRAPHY

The present proposal is only enhancement of capacity will be with process modification without installing any additional machinery. Hence there will not be any topographical changes due to the present proposal.

4.2.1.2 IMPACTS ON CLIMATE

The existing Boiler is adequate for 75 KLPD also. Hence no additional fuel will be used in the existing boiler. Consequently no additional flue gas generation. Temperature of the effluent is not high, it is not causing any thermal imbalance as adequate plantation as per CPCB norms has already been planted in the existing plant premises. Apart from this, there will be natural dispersion of heat due to unstable conditions during day and as such there would be no significant micro/macro climatological changes of any consequence.

4.2.2 PREDICTION OF IMPACTS ON AIR ENVIRONMENT: [GENERIC TOR # 6(i) & 7 i]

It is absolutely essential to study the impacts of air emission on its environs due to the present proposal. These impacts are assessed with the help of Mathematical model based on steady state Gaussian Plume Dispersion Model designed for multiple point sources for short term. In the present case, Industrial Source Complex (ISC-3), 1993 dispersion model based on steady state Gaussian plume dispersion, designed for multiple point sources developed by United States Environment Protection Agency (USEPA) has been used for simulations from point sources.

The present proposal is only enhancement of capacity will be with process modification without installing any additional machinery. The existing 25 TPH Boiler will be adequate for 75 KLPD capacity also. Hence no additional fuel consumption. Consequently there will be no increase in air emissions.

However air quality modelling has been carried out to assess the incremental concentrations of PM, SO_2 & NOx by considering the present micro meteorological data collected during Post monsoon

2016 along with the same emissions which were considered as part of earlier Environmental clearance.

Model Input

Emissions

The emission data from the stack attached to the Boiler is shown in Table 4.1.1

Receptor Locations

The software is capable of generating a polar receptor grid at every 10 radial angles at specified distances (in Kms).

Meteorological data

For the prediction of rise in Ground Level concentrations of PM, SO_2 & NOx, the actual hourly meteorological data recorded at the plant site during the study period **(Post Monsoon - 2016)** is converted to mean meteorological hourly data as specified by CPCB and the same is used in the model. In the absence of site specific mixing heights, mixing heights published in 'Spatial distribution of hourly mixing depths over Indian region' by Dr. R.N. Gupta have been used.

Presentation of results

In the present case model simulations have been carried out for the Post monsoon 2016. For the short term simulations, the concentrations have been estimated at around 1600 receptors to obtain optimum description of variations in concentrations over the site in 10 Km. radius covering 16 directions.

Model Output

The output contains the first through sixth highest concentration values at each receptor, Maximum concentration tables and daily concentration tables for each averaging period.

In the existing Distillery Plant the steam requirement for Process, evaporation and drying of thin slop is being sourced from the 25 TPH Boiler. The Fuel for Boiler is Indian coal/Imported Coal/ Biomass.

The calculations for stack height, ash generation quantity have been done considering the 100% Indian coal, 100% imported coal & 100% Biomass scenarios. There is one stack attached to the existing boiler. The expected emissions from the boiler are PM, SO_2, NO_X. The stacks height is calculated as per CPCB guidelines with the following formulae.

4.2.3 STACK HEIGHT CALCULATION FOR 25 TPH BOILER

(a) With 100% Indian Coal

Coal consumption	:	115 TPD
Sulphur content in Coal	:	0.5% (Max, by mass)
SO_2 emission (Q)	:	115 x 1000 x (0.5/100) x 2/24
		= 47.91 kg/hr
Stack height (H)	:	$14(Q)^{0.3}$
		$14(47.91)^{0.3}$
		44.6 SAY 45 m

(b) With 100% Imported Coal

Coal consumption	:	70 TPD
Sulphur content in Coal	:	0.8 % (Max, by mass)
SO_2 emission (Q)	:	70 x 1000 x (0.8/100) x 2/24
		= 46.66 kg/hr.
Stack height (H)	:	$14(Q)^{0.3}$
		$14(46.66)^{0.3}$
		44.3 **m**

With 100% Rice Husk

Consumption of Biomass	:	135 TPD
Sulphur content in Biomass	:	0.08% (Max, by mass)
SO_2 emission (Q)	:	135 x 1000 x (0.08/100) x 2/24
		9.0 kg/hr.
Stack height (H)	:	$14(Q)^{0.3}$
		$14(9.0)^{0.3}$
		27.0 **m**

[GENERIC TOR # 7 v]

Stack height of 45 m has been already provided to existing boiler for effective dispersion of emissions into the atmosphere. The following are the boiler stack details. There is no change in emissions with this expansion, as same 25 TPH Boiler will be adequate for which EC has already been accorded.

Table 4.1.1

Boiler Stack Details

Item	Units	25 TPH Boiler
Number of stacks		1
Height of the stack	M	45
Internal stack dia at top	M	1.3
Volumetric flow rate	m^3/sec	19.9
Exit velocity of flue gas	m/sec	15
Temperature of flue gas	^0C	160
PM emission quantity	g/s	0.7
SO_2 emission quantity	g/s	11.6
NOx emission quantity	g/s	0.7

The emissions of concern are Particulate Matter (PM_{10}), Sulphur dioxide (SO_2) and Nitrogen oxides (NOx). A stack height of 45 m has been provided to the boiler for effective dispersion of sulphur dioxide emissions into the atmosphere. In the existing plant Bag filters have been provided for effective treatment of flue gases from the boiler to bring down the particulate matter concentration in the exhaust gases to less than 50 mg/Nm^3.

INCREMENTAL GLC`s DUE TO THE PROPOSED PROJECT:

The max predicted incremental rise in SO_2 concentrations (24 hourly) will be 2.6 μg/m^3 at a distance of 675 m from the origin stack in the down wind direction over the baseline concentrations.

The max predicted incremental rise in PM_{10} concentrations (24 hourly) will be 0.16 μg/m^3 at a distance of 675 m from the origin stack in the down wind direction over the baseline concentrations & 0.15 μg/m^3 due to Vehicular movement.

The max predicted incremental rise in NO_X concentrations (24 hourly) will be 0.8 $\mu g/m^3$ at a distance of 675 m from the origin stack in the down wind direction over the baseline concentrations & 1.0 $\mu g/m^3$ due to vehicular movement.

The max predicted incremental rise in CO concentrations (24 hourly) will be 0.53 $\mu g/m^3$ due to vehicular movement.

There are no major industries within the study area. The net resultant maximum concentrations of PM_{10}, SO_2, NOx & CO during operation of the plant are furnished in table 4.1.2. The Net Resultant Ground Level Concentrations during the operation of the plant are within the National Ambient Air Quality Standards (NAAQS). Hence there will not be any adverse impact on air environment due to the present enhancement proposal.

TABLE 4.1.2

NET RESULTANT MAXIMUM CONCENTRATIONS DUE TO 75 KLPD CAPCITY

Item	PM_{10} ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)	NO_X ($\mu g/m^3$)	CO ($\mu g/m^3$)
Maximum baseline Concentration in the study area	56.7	12.7	14.9	568
Maximum predicted incremental rise in concentration due to the proposed plant operation	0.16	2.6	0.8	--
Maximum predicted incremental rise in concentration due to the Vehicular Movement	0.15	--	1.0	0.53
Net Resultant concentrations during operation	**57.01**	**15.3**	**16.7**	**568.53**
National Ambient Air Quality Standards	**100**	**80**	**80**	**2000**

The isopleths of incremental concentration on topographical map shown Annexure – 8.

4.3 PREDICTION OF IMPACTS ON WATER ENVIRONMENT

4.3.1 WATER REQUIREMENT [GENERIC TOR # 3 vii]

Water requirement for 60 KLPD distillery at the time of Environmental clearance in 2012 is 642 KLD. However No increase in water requirement due to capacity enhancement and it remains 642 KLD for 75 KLPD capacity also. This includes Process water, CT make up, DM Water for Boiler & ENA plant, DM Plant regeneration waste water and Domestic requirement. Water requirement for the distillery plant is being sourcing from Ground water & Krishna River at a distance of 1.3 Kms. from the plant. Permission has been obtained for drawl of 250 cum/day of ground water from Ground Water Department, Gov. A.P. and I & CAD, GOAP has accorded permission to draw 800 KLD of

water from Krishna River. Hence no separate water drawl permission is required for the 75 KLPD as the total water requirement remains 642 KLD , whereas permissions obtained was 250 KLD + 800 KLD = 1050 KLD. The water drawl permission are shown in Annexure – 4.

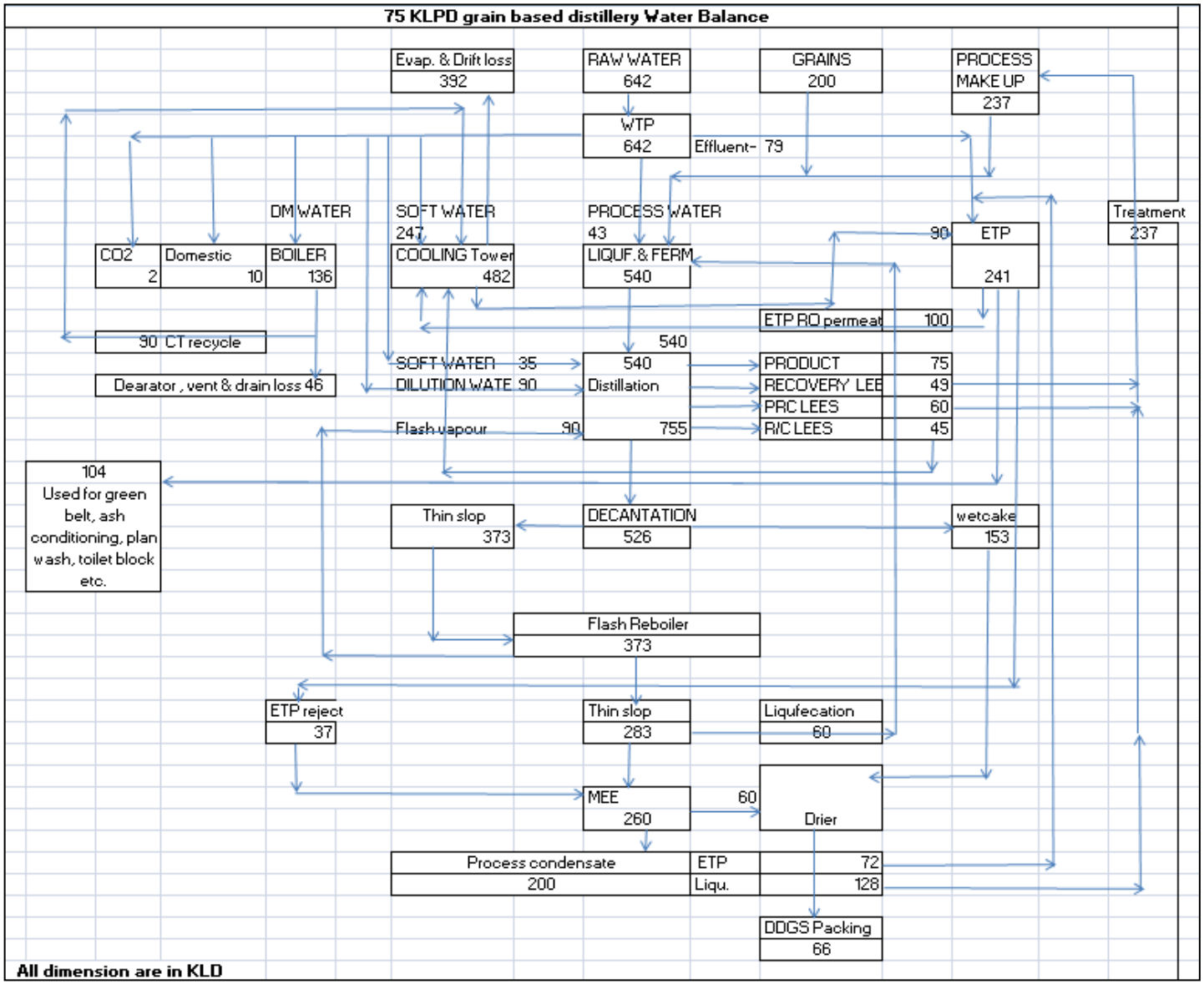
The details of total water consumption, it's breakup are show in Table 4.3.1. The following is the breakup of water requirement for 75 KLPD (After Expansion).

TABLE 4.3.1

WATER BREAKUP FOR 75 KLPD (AFTER EXPANSION)

Section	Quantity (cum/day)
Process water	43
Make-up water for cooling tower	247
DM water for Boiler makeup & for ENA dilution	261
Wastewater from WTP	79
Make up water for CO_2 recovery plant	2
Domestic	10
TOTAL NET WATER REQUIREMENT	**642**

WATER BALANCE (FOR 75 KLD PLANT)



4.3.2 WASTE WATER GENERATION

The total wastewater generation as per the existing environmental clearance is 439 KLD. No additional wastewater generation from the proposed expansion project. The total effluent quantity expected with 75 KLPD capacity (after expansion) will be 437 KLD which is inclusive of spent wash. The details of total waste water generation and it's breakup are show in Table 4.3.2. The characteristics of different effluent streams are presented in Tables 4.3.3 to 4.3.7. The following table shows the effluent streams from 75 KLPD capacity.

TABLE 4.3.2
WASTE WATER GENERATION FROM 75 KLPD CAPACITY

SECTION	QUANTITY (CUM/DAY)
Spent Wash (Thin Slop)	260
Effluent from WTP	79
Boiler blowdown	90 (recycled)
Cooling tower blowdown	90 (recycled)
Blowdown from CO_2 recovery plant	2 (recycled)
Sanitary waste water	8
Total	**437**

WASTEWATER CHARACTERSTICS [GENERIC TOR # 7 iv]

TABLE 4.3.3

S.No.	PARAMETER	SPENT WASH CHARACTERISTICS
1.	pH	4.0 – 4.5
2.	Total Dissolved Solids	10,000 - 12,000 mg/l
3.	COD	50,000 - 60,000 mg/l
4.	BOD	24,000 - 30,000 mg/l

S.NO.	CHARACTERISTICS	SANITARY WASTE WATER	COOLING TOWER BLOW DOWN	BOILER BLOW DOWN	DM PLANT & SOFTNER REGENERATION

					WATER
1.	pH	7.0 – 8.5	7.0 – 8.0	9.5 – 10.5	4.0-9.0
2.	T.D.S. (mg/l)	800 – 900	1000	20	5000-6000
3.	B.O.D. (mg/l)	200 – 250	---	---	---
4.	C.O.D. (mg/l)	300 – 400	---	---	---

4.3.3 IMPACT ON KRISHNA RIVER & GROUND WATER

- Krishna River is flowing at a distance of 1.3 Kms. from the plant.
- Water requirement for the existing plant is being sourced from Krishna River & Ground Water source. Water drawl Permission has been obtained from I&CAD, Govt. of Andhra Pradesh to draw water from Krishna river. Dedicated pipeline has already been laid to transport water from Krishna river to the plant. The water requirement after capacity enhancement is not increasing. Hence existing water pipeline is adequate after expansion also. Hence there will not be any adverse impact on river due to drawl of water due to the proposed capacity enhancement.
- Ground water will be recharged by constructing Rain water harvesting pits in consultation with State Ground Water Board.
- Bag filters have been installed to bring down the particulate emission to within the standards.
- Flue gases in the existing plant are being treated in Bag filters and discharged into the atmosphere through a stack of 45 m height which is connected to the 25 TPH boiler. The existing boiler is adequate for 75 KLPD capacity also. Hence no additional fuel and no increase in air emissions.
- Thin slop generated is being concentrated in the Evaporation system up to 35% solids (w/w). This concentrated spent wash (35 % Solids) is being sent to the drier along with wet cake generated from Decanter for making DDGS with 90 % solids and the DDGS obtained is sold as cattle feed and fish feed.
- Due to the capacity enhancement, there will be no increase in effluent generation. Hence the existing ETP is adequate to treat the effluent from 75 KLPD capacity.
- The non process effluent is being treated in ETP and utilized for Process, CT makeup greenbelt development after ensuring compliance with MoEF / SPCB norms.

- Ash generated from the project is being given to the nearby brick manufacturers / cement plants.
- DDGS generation with 75 KLPD is 58 TPD and will be used as cattle feed and fish feed after expansion also.

Hence there will not be any impact on Krishna River & ground water on its downstream users due to the present capacity enhancement.

4.4 PREDICTION OF IMPACTS DUE TO NOISE

4.4.1 PREDICTION OF IMPACT DUE TO THE PROPOSED ACTIVITY

In the existing plant major noise generating sources are STG, Boiler, compressors & DG set. In the existing plant more than 1/3rd of the total area has been developed with greenbelt as per CPCB norms. Acoustic enclosures have been provided to STG. Ear plugs have been provided to employees who are working in noise prone areas.

The capacity enhancement will be achieved with modification the existing infrastructure. Hence there will not be any adverse impact on noise environment due to the capacity enhancement proposal.

The Ambient Noise levels are within the standards prescribed by MOEF & CC, GOI. Even after expansion also, the ambient noise levels will be less than 75 dBA during day time & less than 70 dBA during night time.

4.4.2 PREDICTION OF IMPACTS ON COMMUNITY

Day and Night sound pressure levels, Ldn are often used to describe the community noise exposure, which include 10 dBA night time penalty. As the nearest village is 1.6 Kms. from the plant, the impact of noise on general population would be insignificant.

As per the WHO recommendation, there is no identified risk and damage of hearing due to the noise levels (Leq = 8 hours) less than 75 dBA. Most of the international damage risk criteria for hearing loss permit (Leq = 12 hours) upto 87 dBA. Further, WHO recommendation on community noise annoyance, permits day time out door noise levels of 55 dBA. Leq and night time outdoor noise level of 45 dBA leq to meet sleep criteria i.e. Leq (24 hours) = 52.2. dBA and Ldn = 5.5 dBA.

4.4.3 PREDICTION OF IMPACT ON OCCUPATIONAL HEALTH

The damage risk criteria as enforced by OSHA (Occupation Safety and Health Administration) to reduce hearing loss, stipulates that noise level upto 85 dBA are acceptable for 8 hour working shift per day. The capacity enhancement will be achieved without any additional plant & Machinery and by making suitable process modifications only. Hence there will not be any adverse impact on noise environment due to the capacity enhancement proposal. The Ambient Noise levels are within the standards prescribed by MOEF & CC, GOI. Even after expansion also, the ambient noise levels will be less than 75 dBA during day time & less than 70 dBA during night time.

4.5 PREDICTION OF IMPACTS ON LAND ENVIRONMENT

28.98 acres of land has been acquired for the distillery plant of 60 KLPD. Enhancement of distillery plant production capacity from 60 KLPD to 75 KLPD with process modifications without installing additional machinery. Spent wash generated from the existing plant is being taken to decanter and centrifuged to obtain wet cake (DWGS) and the supernatant from Decanter is concentrated to 90% solids in MEE followed by Dryer. The DDGS (90 % Solids) is being used as Cattle Feed. Hence zero discharge is being implemented in the existing distillery plant as per CPCB norms. The boiler blow down will be used as cooling tower makeup & CT Blow down will be sent to ETP. The scrubbed water from CO_2 recovery Plant will be utilized in the Fermentation section. Non process effluents (WTP waste) will be sent to ETP and after ensuring compliance with CPCB/APPCB standards, the treated effluent will be utilised for dust suppression, ash conditioning and for greenbelt development. As there are no rare and endangered species in the vicinity of the proposed activity, there will not be any concern for the loss of important germ plasm that needs conservation. Greenbelt is considered essential for maintaining the stability of the environment of the area. Extensive greenbelt has been developed in more than 1/3rd of the land within the plant premises as per CPCB guidelines.

4.6 PREDICTION OF IMPACTS DUE TO VEHICULAR MOVEMENT: [GENERIC TOR # 6 ix & 7 iii]

Total no. of trucks required for transportation of raw materials and products due to the present enhancement will be a maximum of 4 per day. As the covered trucks will be used for the transpirations of raw material and covered tankers to transport the product, there will not be any fugitive emission. Hence there will not be any fugitive dust generation during transportation of raw materials. Pucca road exist upto the site. The existing road is capable of absorbing this additional

truck movement. Hence there will not be any adverse impact on vehicular traffic due to the proposed expansion project. The area earmarked for truck parking in the existing plant is 2.0 acres and same area is adequate for expansion project also.

Vehicular Traffic Study

- Vehicular Traffic survey has been conducted from plant to Ravulapalem route and vice versa.
- The details of Traffic survey are shown in below Table.
- From the table we can confirm that the maximum additional load due to this expansion will not lead to stress in the road carrying capacity as specified by the Indian Road Congress (IRC).

Traffic Survey & adequacy of road for additional traffic

Type of Vehicle	Existing Vehicular Traffic per day									Peak Traffic due to the proposed expansion per day							Total PCU during plant operations Per day	Carrying Capacity PCU (per Day) as per IRC : 64-1990
	From Crux plant to Ravulapalem			From Ravulapalem to Crux plant			Total per day			From Crux plant to Ravulapalem			From Ravulapalem to Crux plant			Total PCU (per day)		
	Actual Count	As % of Total Vehicular Count	As PCU	Actual Count	As % of Total Vehicular Count	As PCU	Actual Count	As % of Total Vehicular Count	As PCU	Actual Count	As % of Total Vehicular Count	As PCU	Actual Count	As % of Total Vehicular Count	As PCU			
Two wheeler	112	31.7	84.0	103	28.8	77.2	215	30.2	161.2	-	-	-	-	-	-	--	161.2	**2000 (Single line road)**
Three wheeler	76	21.5	152.0	68	19.0	136.0	144	20.2	288.0	-	-	-	-	-	-	--	288.0	
Car/Jeep	52	14.7	52.0	61	17.1	61.0	113	16.0	113.0	-	-	-	-	-	-	--	113.0	
Truck/Bus/ Tractor/ Tanker	95	27.0	285.0	108	30.1	324.0	203	28.6	609.0	4	100	12.0	4	100	12.0	24.0	633.0	
Non-motorable vehicles	18	5.1	36.0	18	5.0	36.0	36	5.0	72.0	-	-	-	-	-	-	-	72.0	
Total per day	**353**	**100**	**582.0**	**358**	**100**	**634.2**	**711**	**100**	**1243.2**	**4**	**100**	**12.0**	**4**	**100**	**12.0**	**220.0**	**1267.2**	

- Without expansion Max. PCU per day = 1243.2
- Additional PCU due to this expansion activity per day = 24.0
- Total PCU during operation of expansion per day = 1267.2 which is less than 2000 PCU/Day
- Hence there will not be any adverse impact on vehicular traffic due to the proposed expansion activity and road network is capable of handling this increase in vehicular traffic due to the expansion activities.

4.7 PREDCTION OF IMPACTS ON FLORA & FAUNA, HUMAN BEING AND AGRICULTURAL LAND

Spent wash generated from the distillery plant is being treated in decanter and then concentrated to 90% solids by treating them in MEE & Dryer. The DDGS obtained is used as cattle feed/Fish feed. Hence zero discharge is being implemented in the existing plant as per CPCB norms. The spent wash treatment technology is approved by CPCB. Hence existing ETP is adequate for 75 KLPD capacity also.

The flue gases from the Boiler is being treated in Bag filters and discharged through a stack height of 45 m connected to the 25 TPH boiler for effective dispersion of sulphur dioxide emissions into the atmosphere. The particulate matter in the exhaust gas is complying with the stipulated norm in EC. The existing boiler is adequate for 75 KLPD also. Hence no additional fuel and no additional emissions due to the enhancement proposal.

There are no rare & endangered species in the study area. All the required emission control systems are installed and operated to comply with MOEF/CPCB/APPCB norms. Hence there will not be any adverse impact on flora & fauna due to the present proposal.

Hence there will not be any adverse impact on flora & fauna, Human being and Agricultural land due to the capacity enhancement of the Distillery.

4.8 PREDCTION OF IMPACTS ON RESERVE FOREST [SPECIFIC TOR # 2]

The following reserve forests are situated with in 10 Km. radius from the plant site.

A) Venkataya Palem RF _ 2.3 Kms.

B) Jaggayyapeta RF – 2.4 Kms.

C) Gudimetla RF – 4.1 Kms.

D) Gingupalle RF- 4.1 Kms.

E) Kuntimaddi RF – 5.0 Kms

The flue gases from the Boiler is being treated in Bag filters and discharged through a stack height of 45 m connected to the 25 TPH boiler for effective dispersion of sulphur dioxide emissions into the atmosphere. The particulate matter in the exhaust gas is complying with the stipulated norm in EC. The existing boiler is adequate for 75 KLPD also. Hence no additional fuel and no additional emissions due to the enhancement proposal.

- Intiallly spent wash is being sent to decanter to remove solids which is known as DWGS and the supernatant will be sent to Multiple Effect Evaporator (MEE) for the concentration upto 35-40% of solids. This concentrated syrup along with DWGS will be sent to dryer along and will be further concentrated to 90 % solids to produce dry powder. The dry powder which is high in protein is called Distillers Dried Grain Soluble (DDGS) and is giving as cattle feed / prawn feed / fish feed. Hence liquid spent wash will be converted to protein rich dry powder. The viability of grain based distillery is with sale of DDGS (By-product).
- The boiler blow down will be used as cooling tower makeup & CT Blow down will be sent to ETP. The scrubbed water from CO_2 recovery Plant will be utilized in the Fermentation section. Non process effluents (WTP waste) will be sent to ETP and after ensuring compliance with CPCB/APPCB standards, the treated effluent will be utilised for dust suppression, ash conditioning and for greenbelt development.
- This is a zero discharge based spent wash treatment technology approved by CPCB. Hence there will not be any ground water/surface water contamination due to the proposed project.
- Ash will be stored in silo and ash disposal will be in accordance with MOEF notification on fly ash utilization.
- No smell problem will be caused as spent wash will be stored in the closed tank, spent wash transportation will be in pipes, covered fermentation will be adopted.

In this way all required environmental protection measures will be implemented and operated to comply with the norms.

As the net resultant Ground Level Concentrations of PM, SO2 & NOx are well within the National Ambient Air Quality Standards (NAAQS), Interlocking system is also proposed to Bag filters, ash will be stored in silo and Zero spent wash treatment technology approved by CPCB is proposed, certainly there will not be any adverse impact on the flora and fauna in the area due to the proposed expansion project.

4.9 PREDCTION OF IMPACTS ON SOCIO ECONOMIC ENVIRONMENT

There will not be any increase in employment due to the enhancement proposal. However Priority will always be given to local people for employment of Unskilled workers that arise during the course of time.

CSR activities are being carried out in the existing plant. Similar practice will be carried out after expansion also.

CHAPTER – 5
ANALYSIS OF ALTERNATIVES
(TECHNOLOGY & SITE)

5.1 ALTERNATIVE TECHNOLOGIES

Fermentation technology for producing Alcohol was well proven technology over a few decades all over the world. The existing plant is also in operation for a few years and no technological problems have been arised. The present proposal of capacity enhancement will be achieved by process modifications. Apart from this, there are several other grain based distilleries also in operation in India without any technological failures.

5.2 ALTERNATIVE SITES EXAMINED FOR SETTINGUP OF PLANT [GENERIC TOR # 4 i & 4 iii]

M/s. Crux Biotech India Private Limited, operating 60 KLPD grain based distillery plant & 2.5 MW power plant in Sy.Nos.529p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh. Industry has obtained Environmental clearance from MOEF&CC, New Delhi vide letter No. F.No.J.11011/579/2010-IA II (I) dated 16/10/2012 as the plant site was in accordance with the MoEF&CC norms. 60 KLPD grain based distillery has a valid Consent to Operate (CTO) issued by the A.P. Pollution Control Board. Now it has been proposed to enhance the production capacity from 60 KLPD to 75 KLPD in the same 28.98 acres of land pertaining to existing plant by making suitable process modifications. Hence the plant site is in accordance with the guidelines issued by MoEF&CC. The following are the salient features of the plant site.

- The plant area does not fall under the industrial areas / cluster, which are listed in MoEF office memorandum dated 13th January 2010 and its subsequent amendments for Critically Polluted area.
- Nearest Habitation peddavaram is at a distance of 1.6 Kms. from the plant site.
- There are no National Parks/Wild life sanctuaries/Tiger Reserves/Elephant corridors within10 Km. radius of the plant site.
- No historical places and places of tourist importance within 10 Km radius of the plant site.

- Krishna river is flowing at a distance of 1.3 Kms. & Nagarjuna Sagar Left Bank Canal- 3.4 Kms. from the plant site.
- There is no interstate boundary with 5 Km. radius of the plant site. Nearest interstate boundary is Telangana is at distance of 10.1 Kms. from the plant site.
- The following reserve forests are situated with in 10 Km. radius from the plant site.

A) Venkataya Palem RF _ 2.3 Kms.

B) Jaggayyapeta RF – 2.4 Kms.

C) Gudimetla RF – 4.1 Kms.

D) Gingupalle RF- 4.1 Kms.

E) Kuntimaddi RF – 5.0 Kms.

Since the present proposal is only enhancement of production capacity in the same land for which Environmental clearance has been accorded, the site is in accordance with the norms. Hence no alternative sites have been chosen for the capacity enhancement of distillery plant from 60 KLPD to 75 KLPD.

CHAPTER – 6
ENVIRONMENTAL MONITORING PROGRAM

6.1 TECHNICAL ASPECTS

6.1.1 METHODOLOGIES

To know the effectiveness of environmental mitigation measures post project environmental monitoring program will be strictly followed as per statutory requirement.

- Particulate matter in the exhaust gas of the 25 TPH Boiler will always be maintained below 50 mg/Nm^3.
- Energy meters are being provided to all air emission control systems, ETP units to ensure effective operation of the control systems.
- Zero spent wash effluent discharge is being always be maintained to comply with CREP recommendations.
- All emission control systems are taken-up for maintenance as per prescribed dates and always ensure compliance with norms.
- APPCB will also carry out Stack monitoring, Ambient Air quality & Effluent analysis at regular intervals. This will also help in cross checking the performance of emission control systems implemented in the plant.

6.1.2 FREQUENCY & LOCATIONS OF ENVIRONMENTAL MONITORING

A comprehensive monitoring program is given under. This environmental monitoring will be entrusted to a third party.

MONITORING SCHEDULE FOR ENVIRONMENTAL PARAMETERS

S.NO	PARTICULARS	FREQUENCY OF MONITORING	DURATION OF SAMPLING	PARAMETERS REQUIRED TO BE MONITORED
1. Water quality				
	Water and waste water Quality a) Industrial Effluents. b. Ground water	Online	continuous	pH, EC, TDS, BOD, COD, Cl, SS, Sulphates

S.NO	PARTICULARS	FREQUENCY OF MONITORING	DURATION OF SAMPLING	PARAMETERS REQUIRED TO BE MONITORED
	Quality (Peizometric wells around spent wash storage area, ETP)	Once in a month	Grab sampling	As per BIS: 10500
2. Air Quality				
A.	Stack Monitoring	Continuous Online monitoring Once in a month		PM SO_2 & NOx
B.	Ambient Air quality	AAQMS	24 hours continuously	PM_{10}, $PM_{2.5}$, SO_2 , NOx & CO
3. Meteorological Data				
	Meteorological data to be monitored at the plant.	Daily	Continuous monitoring	Temperature, Relative Humidity, rainfall, wind direction & wind speed.
4. Noise level monitoring				
	Ambient Noise levels	Twice in a year	Continuous for 24 hours with 1 hour interval	

6.1.3 DATA ANALYSIS

All the parameters will be analysed as per BIS procedures specified for those parameters. All water samples will be analysed for various parameters as per IS: 10500 with the specified procedures.

Online stack monitoring meter has been provided to the stack to monitor PM continuously. Continuous online monitoring system has been established to monitor wastewater quality.

6.1.4 REPORTING SCHEDULE

After completion of analysis a copy of all the analysis reports will be sent to the Regional office of the Ministry of Environment, Forest & Climate Change, Chennai & APPCB on regular basis. Copy of the reports will be maintained in the plant and will be made available to the concerned inspecting authorities.

6.1.5 EMERGENCY PROCEDURES

The Boiler along with other machinary will be shut down as per the procedure to have least environmental impact.

6.1.6 DETAILED BUDGET & PROCUREMENT SCHEDULES

A third party is being engaged to monitor all the environmental parameters as per CPCB/APPCB norms. The annual budgetary allocation for environmental monitoring: Rs. 10 Lakhs.

CHAPTER – 7
ADDITIONAL STUDIES

7.1 INTRODUCTION [GENERIC TOR # 3 ix & 7 xiii]

Risk analysis deals with the identification and quantification of risks, the plant equivalent and personnel are exposed to, due to accidents resulting from the hazards present in the factory. Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) Involved in the factory.

Both hazard and risk analysis very extensive studies, and require a very detailed design and engineering information.

The various hazard analysis techniques that may be applied are Hazard and Operability (HAZOP) studies, Fault – Tree Analysis (FTA), event –tree analysis and failure and effects mode analysis.

Risk analysis follows an extensive hazard analysis. It involves the identification and assessment of risks the neighbouring populations are exposed to as result of hazard present. This requires a through knowledge of failure probability, credible accident scenario, vulnerability of populations etc., much of this information is difficult to get or generate. Consequently, the risk analysis is often confined to maximum creditable accident studies.

7.2 SCOPE OF THE STUDY

The scope of study includes the study of proposed operations, storage and handling of raw materials with respect to Hazard Identification. Risk Assessment and preparation of Disaster Management Plan. Based on the Hazard Identification and analysis, the major disaster scenarios would be worked out to estimate the consequence of failure. A Disaster Management Plan (DMP) would also be evolved to meet the emergency situation including the occupational health and safety.

7.3 STORAGE TANKS

Details of tank farms in the existing plant are shown in Table 7.1

TABLE - 7.1

Details of the Tank farms

Description of The Tank	Tank Capacity (m^3)	No. of Tanks	Total capacity (m^3)
ENA Daily Receivers	65.787	3	197.361
ENA Bulk storage	594.316	3	1782.948
Impure spirit Daily Receivers	4.892	2	9.784
Impure spirit Bulk Storage	98.682	1	98.682
Fusel oil storage	4.892	1	4.892
Total			**2093.667**

The existing inventory of products will remain the same even after the capacity enhancement. Hence separate risk analysis is not required. However for the inventory specified in the afore mentioned table, hazard distances have been calculated with the help of model.

7.4 FIRE PROTECTION SYSTEMS PROPOSED

The following Fire Protection system has been provided in the existing distillery plant:

- Hydrant system covering the entire plant including all important auxiliaries and buildings is proposed. The system is complete with piping, valves instrumentation, hoses, nozzles and hydrants, valves etc.
- High velocity water spray system near storage tanks.
- Portable extinguisher such as pressurized water type, carbon dioxide type and foam type is located at strategic locations through out the plant.

The following pumps have been provided in the fire protection system.

Fire water pumps

a) AC motor driven fire water pumps for hydrant, medium velocity water spray system and foam system.

b) AC motor driven fire water pumps for high velocity water spray system.

c) Diesel engine driven pump as stand by for the above.

d) Jackey pump 1 no. (AC motor driven) for maintaining pressure.

7.5 SAFETY PROVISIONS PROVIDED

The following safety provisions have been provided in the plant

- Flame arrestors on the top of all the storage tanks.
- Flame proof fitting to all the systems which handles the alcohol.
- Transfer of alcohol by pipes only.

- All the lightings are of flame proof.
- Water sump with a holding capacity of minimum 500 m^3.
- Foam Extinguishers inside the warehouse.

7.6 METHODOLOGY OF MCA ANALYSIS

The MCA Analysis involved ordering and ranking of various sections in terms of potential vulnerability. The following steps were involved in MCA Analysis.

- Preparation of an inventory of major storages and rank them on the basis of their hazard properties.
- Identification of potentially hazardous storage sections and representative failure cases from the vessels and the pipelines.
- Visualisation of chemical release scenarios.
- Effect and damage calculation from the release cases through mathematical modeling.
- Inventory Analysis and Fire & Explosion and Toxicity Index (FETI) are the two techniques employed for hazard identification process.

7.7 FIRE & EXPLOSION AND TOXICITY INDEX

The role of Fire & Explosion Toxicity Index (FET) aids in quantitative hazard identification. The FET is calculated by evaluating the loss potential of all the units in the storage area and the hazardous areas were classified accordingly. The role of FET is

- Identification of the equipment/areas that could likely contribute to the creation or escalation of incident and relatively rank the incidents.
- Quantification of the expected damage of potential fire and explosion incidents.
- Preparation of guidelines for mitigating fire hazards.

The loss potential which could actually be experienced under the most adverse operating conditions is quantitatively evaluated. The FEI is used for any operation in which a flammable, combustible or reactive material is stored, handled or processed.

FEI = MF * GPH * SPH

Where MF: Material factor

GPH: General Process Hazard

SPH: Special Process Hazard

TOXICITY INDEX

The Toxicity Index is calculated using the Nh, GPH and SPH. TI is calculated by the following formula.

$$TI = \frac{(Nh + Ts) * (1 + GPH + SPH)}{100}$$

The degree of hazard is identified based on FEI & TI range as per the criteria given below.

FEI RANGE	DEGREE OF HAZARD
0 – 60	LIGHT
61 – 96	MODERATE
97 – 127	INTERMEDIATE
128 – 158	HEAVY
159 & Above	SEVERE

TI RANGE	DEGREE OF HAZARD
0 – 5	LIGHT
5 - 10	MODERATE
> 10	SEVERE

Depending on the category of hazard preventive and protective system is recommended.

7.8 ASSESSMENT OF RISK AT M/s. CBIPL

Based on the storage inventory the following areas are identified as potential safety risk areas are shown below.

TABLE 7.2

POSSIBLE RISKS FROM THE DISTILLERY PLANT

S. No.	Block / Areas	Quantity	Hazard Identified
1.	Boiler	25 TPH	Fire & Explosion
2.	Spirit storage	2094 m^3	Fire

7.9 RISK & CONSEQUENCE ANALYSIS OF FIRE

TABLE 7.3

List of products and NFPA Ratings

Sl.No.	Chemical	NFPA Ratings		
		Nh	NF	Nr
1.	Ethanol	0	3	0

Explanation of NFPA ratings is given in **Table 7.4**

TABLE 7.4

Explanation of NFPA Hazard Classifications

Health Hazard	Definition
4	Materials which on very short exposure could cause death or major residual injury even though prompt medical treatments were given.
3	Materials which on short exposure could cause serious temporary or residual injury even though prompt medical treatments were given.
2	Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
1	Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.
0	Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.
Flammability	**Definition**
4	Materials which will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or which are readily dispersed in air and which will burn readily
3	Liquids and solids that can be ignited under almost all ambient temperature conditions.
2	Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.
1	Materials that must be preheated before ignition can occur.
0	Materials that will not burn.
Reactivity	**Definition**
4	Materials which in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
3	Materials which in themselves are capable of detonation or explosive reaction bur require a strong initiating source or which must be heated under confinement before initiation or which must be heated under confinement before initiation or which react explosively with water.
2	Materials which in themselves are normally unstable and readily undergo

	violent chemical change but do not detonate. Also materials which may react violently with water or which may form potentially explosive mixtures with water.
1	Materials which in themselves are normally stable, but which can become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently.
0	Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.

METEOROLOGICAL DATA

The atmosphere acts like a large non-homogeneous reactor with several accompanying complimentary phenomena. Meteorological information plays an important role in the risk analysis. The atmospheric stability conditions, wind speed, wind directions, humidity etc. are necessary to find the damage potential due to any chemical release.

Atmospheric stability is important with regard to the extent to which it suppresses or enhances the vertical movement in the air's turbulent motion. This is most strongly a function of vertical temperature profile in the atmosphere. If a volume of air rises, it would normally be expected to expand. If the rate of cooling with height by this process equals the vertical temperature profile then turbulence is neither suppressed nor enhanced. Such conditions are termed neutral. If the vertical temperature profile is more marked then turbulence is enhanced and if the profile is less marked then turbulence is suppressed. Neutral conditions correspond to a rate of decrease in temperature with height of about 1^0 C per 100 meters.

Atmospheric stability is a very important factor for predicting the dispersion characteristics of gases/vapors of the surrounding environment. Change in atmospheric stability is due to the direct consequence of its vertical temperature structure.

For a given location, this tends to vary from season to season. Wind speed and stability conditions/ will be obtained from local meteorological records whenever possible. Where these stability data are not available, the stability effects are mathematically represented through pasquill parameters.

In Pasquill stability categorisation, class A is the one having most unstable and class F is the most stable weather condition. An unstable weather condition promotes better dispersion; a high wind speed and high incoming solar radiation favour the formation of unstable weather condition.

Turbulence induced by buoyancy forces in the atmosphere is closely related to the vertical temperature structure. The magnitude of atmospheric temperature gradient is compared against the Adiabatic Lapse Rate (ALR=0.98^{0}C/100m), which is the rate of temperature change with height for a parcel of dry air rising adiabatically. In neutral stability the gradient is equal to the ALR. Stable conditions refer to a gradient less than the ALR (ultimately to a temperature inversion) and unstable conditions to greater than the ALR.

Stability Class	Atmospheric Condition
A	Very Unstable
B	Unstable
C	Slightly Unstable
D	Neutral
E	Stable
F	Very Stable

Condition of atmospheric stability is estimated by a suitable method that uses dispersion parameters viz., vertical temperature gradient, and wind profile and roughness factor. The roughness factor for the area is small since it mainly comprises of plain land. In general, very stable and stable conditions are highly favourable for evaporation and dispersion of gases and hence for maximum credible accident calculations, only these stability conditions are assumed.

7.10 RESULTS OF CONSEQUENCE ANALYSIS

Maximum Credible Accident and Consequence **(MCAC)** Analysis aims at identifying the unwanted hazardous events which can cause damage to human beings and the environment in and around **M/s Crux Biotech India Private Limited** alcohol storage facilities at Peddavaram Village. For this purpose a host of probable or potential accident scenarios have been visualized, examined, screened and the credibility of the most probable events established.

The following steps have been followed for the analysis:

- A detailed study of the storage and handling information
- Identification of representative failure cases of the tanks.
- Consequence analysis of the release cases and shortlisting of the most hazardous events.

The release scenarios are selected based on hazard identification, past accident data and engineering judgement. Chemicals handled in this transfer operation are basically non-boiling in nature. Spillage of these chemicals may lead to heat radiation effects.

7.10.1 IDENTIFICATION OF POTENTIAL HAZARD AREAS

The facilities are examined along with the layout. An inventory of the amount of various chemicals to be stored is made. The consequence in terms of heat radiation due to release of chemicals are broadly analysed.

7.10.2 RELEASE SCENARIOS

The releases of chemical from the pipe line over the ground from the land point to the storage terminal, storage tank failure are all the possible scenarios. Failure of underground pipe line has not been considered credible. Even in case of such a failure, the released material will be confined underground and is unlikely to find an ignition source.

7.10.3 SOURCE STRENGTH ESTIMATION

Mathematical models are employed to estimate the outflow the liquids. In general, liquid release can be expected from pipe failures as the pipe line extends over a long distance. The released liquid will form the pool which can spread. The most vulnerable section of the piping network will be near flanges, valves and other fittings. It may be worthwhile for **M/s. Crux Biotech India Private Limited** to provide some sort of collecting mechanism to hold any unexpected release near the loading area and isolation valves. Major failures of pipe line will lead to pool formation which on ignition can lead to pool fire.

7.10.4 CONSEQUENCE ANALYSIS

Consequence Analysis is a tool to estimate the potential damage due to accidental release of a hazardous chemical. A large number of failure cases can lead to the same type of consequences hence representative failure cases are selected for this analysis.

The release scenarios are selected based on hazard identification, past accident data and engineering judgment. Alcohol, which is proposed to be handled in this storage and transfer operation, is basically non-boiling in nature. Spillage of the alcohol, if it finds any ignition source, may lead to heat radiation effects.

7.10.5 HEAT RADIATION EFFECTS DUE TO POOL FIRE

M/s. Crux Biotech India Private Limited handles alcohol which is basically non-boiling liquid, it can cause heat radiation effects due to pool fires. The release of combustible liquid can take place due to catastrophic rupture of the tank itself or rupture of a transfer line. In case of a transfer line, the spillage can be stopped through isolation valves. However, in case of rupture of tanks or the line close to the tank (before isolation valve), the release can be large enough to fill the bund. This may likely to result in a pool fire in case of immediate ignition. This could be the worst possible scenario in the storage area as far as the heat radiation effects are concerned.

It is found that pool fires generally tend to have localized effects and are mainly of concern in establishing the potential for cascade effects and employee safety zones rather than for any off-site problem. The estimation of damage distance can help in solving issues connected with inter tank spacing, thermal insulation, fire/wall barrier specification etc.

The estimation of heat radiation depends on the bund size (which is same as pool volume in the case of catastrophic rupture of the tank leading to spillage of large quantity of the chemical), burning rate (a property which depends on the heat of combustion and latent heat of vaporization), surface emitted power (which takes into consideration the radiated fraction of total combustion power), besides the atmospheric transmissivity and geometric view factor. However, the following points are to be noted:

- Duration of burning varies with the quantity spilled. However, it does not have any direct effect on the radiation levels.
- Burning rate is independent of the meteorological conditions so long as sufficient oxygen is available in the atmosphere. We assume complete combustion in our calculation.
- The pool fire doesn't depend on the material of construction of bund and bund floor. However, the surface emitted power by the chemical is included in the mathematical calculation.

It should be noted that the damage distances due to heat radiation is independent of the quantity spilled. It depends on the area exposed. However, the quantity will determine the duration of the fire.

Release of flammable liquid followed by ignition may lead to pool fire. The transfer lines of **M/s. Crux Biotech India Private Limited** mostly will go over the ground all over the storage terminal. Release and spreading of chemicals at the storage tank area is quite possible.

In case of leak / rupture of transfer line at the storage terminal may spill and spread the chemical. On immediate ignition the scenario will be spreading of burning pool. Delayed ignition may also lead to spreading of burning pool or confined pool fire if there are bunds. Spreading burning pools cause less damage than the pool fire resulting after spreading as the spreading area is less due to loss of chemicals in the burning. In case of leak of underground lines, released chemicals will diffuse from the ground and form a pool on the ground but quantity in the pool will be low as the ground itself acts as an obstruction. On ignition, this will damage pipeline due to heating which leads to catastrophic failure of transfer line. Nevertheless, this situation has remote probability. There will be no increase in the inventory of alcohol. Hence there will not be any adverse impact due to the present capacity enhancement proposal.

The thermal radiation effects due to pool fires at the storage terminal are calculated and the results are presented in **Table 7.5**

TABLE 7.5

THERMAL RADIATION EFFECTES DUE TO FIRE

S.No.	Thermal radiation intensity (KW/m^2)	Hazard distance (m)
1	37.5	4.5
2	12.5	12
3	4.0	23

4 KW/m^2 thermal radiation intensity occurs at a distance of 23 m and will be within the premises. Hence no outside population would be affected due to the pool fire scenario. There will be no effect on any structure related to the plant.

A heat radiation effect of 37.5 KW/m^2 can cause sufficient damage to adjacent units and fatality rates will be 100%. 12.5 KW/m^2 level can cause ignition of wood, melt plastic tubing etc., while 4.0 KW/m^2 can cause pain to personnel if unable to reach cover within 20s. However, blistering of the

skin (second degree burns) is likely but the lethality level will be zero. The firemen with protective clothing can handle the fire without discomfort under this heat radiation level.

If a tank ruptures and results in a pool fire, this will spread to other tanks in the same enclosure. If the other tanks/bunds also catch fire because of the cascade effects, the difference will mainly be that the total heat flux will remain the same but the fire will last for a longer duration. This is because the scenario chosen covers the chemical with maximum radiation intensity and maximum quantity.

7.11 FREQUENCY / PROBABILITY ESTIMATION

The reliability data of pipelines and atmospheric storage tanks are presented here from the international database. These cannot be taken as absolute values as there is no information available for Indian conditions. Therefore, these can be taken indicative values

The probability of tank failures, pipe ruptures and ignition are presented below:

Atmospheric storage tank failure rate	1×10^{-5}/yr
Pipe line failure (pipe lengths between connections)	
25 mm $ or less	30×10^{-6}/yr
50 mm $	7.5×10^{-6}/yr
100 mm $	4×10^{-6}/yr
150 mm $ or greater	3×10^{-6}/yr

7.12 RECOMMENDATIONS

I. General Recommendations to Combat Liquid Pool Fires

The major hazard in a flammable storage may arise from pool fire of combustible liquid. Removal of all ignition sources and maintaining sterile conditions in and all around the plant area.

II. Measures for Containing Liquid Pool Fires

Pool fire in one part of the installation may spread to another unless it is adequately contained. It is essential to provide spill-impounding areas popularly known as bunds to prevent spread of liquid from the immediate spill area to other sections and if the liquid from the immediate spill is ignited despite safety precautions, impounding areas will serve to control the fire hazard by

- Minimizing the fire size thus reducing radiant heat exposure to the surroundings
- Localizing the need for fire protection.

III. General Recommendations

Hence no specific recommendation are envisaged. However the following have been take care in the existing plant.

i. Joints in piping to be kept to a minimum. Piping more than 50 mm outside diameter should have welded or welded flanged joints except when connecting to equipment fitted with screwed connections. Piping 50 mm diameter and less may have screwed joints. Where piping has screwed joints, which may be subjected to vibration, consideration should be given to tack welding them to prevent them from coming loose.

ii. To prevent the accumulation of static electricity metal piping is electrically continuous so that the resistance to earth of the installation does not exceed 10^6 ohms. Reference should be made to BS 5958: Part 1:1980 for further information.

IV. Specific Recommendations

i. Hydrocarbon sensors have been provided at the vulnerable areas and in case of any alcohol vapor release, immediate action to be taken to dilute the alcohol vapor concentration by suitable vapor dispersal mechanism.

ii. The entire area has to be kept free from the sources of ignition and made sterile during the storage, handling and transfer operation of all flammable chemicals.

iii. The piping design conforms to the codes and regulations.

iv. In case of a spill, mobile foam dispending system can be effective in reducing vapor generation by minimizing surface area exposed to atmosphere in addition to providing containment.

v. Other protective gadgets like gloves, DCP, CO_2 Extinguishers are made available when required.

The thick green belt has already been developed and is helping to mitigate the radiation intensity levels further and no outside population will be affected.

7.13 DISASTER MANAGEMENT PLAN

7.13.1 DISASTERS

A disaster is catastrophic situation in which suddenly, people are plunged into helplessness and suffering and as a result, need protection, clothing, shelter, medical and social care and other necessities of life.

Disasters can be divided into two main groups. In the first, are Disasters resulting from natural phenomena like earthquakes, volcanic eruptions, cyclones, tropical storms, floods, avalanches, landslides etc. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are industrial accidents, radiation accidents, factory fires, explosions and escape of toxic gases or chemical substances, river pollution, mining or other structural collapses, air, sea, rail and road transport accidents and can reach catastrophic dimensions in terms of human loss.

There can be no set criteria for assessing the gravity of a disaster in the abstract since depends to a large extent on the physical, economic and social environment in which it occurs. What would be considered a major disaster in developing country, will be equipped to cope with the problems involved, may not mean more than temporary emergency elsewhere. However all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international level, for the rescue and relief of the victims. This includes the search for the dead and injured, medical and social care, removal of the debris, the provision of temporary shelter for the homeless food, clothing and medical supplies, and the rapid reestablishment of essential services.

7.13.2 OBJECTIVES OF DISASTER MANAGEMENT OF PLAN

The disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of Disaster Management Plan, it will be widely circulated and personnel training through rehearsals.

The Disaster Management Plan would reflect the probable consequential severity of undesired event due to deteriorating conditions or through knock on effects. Further the management should be able to demonstrate that their assessment of the consequences uses good supporting evidence and based on currently available and reliable information, incident data from internal and external sources and if necessary the reports of out side agencies.

To tackle the consequences of a major emergency inside the factory or immediate vicinity of the factory, a Disaster Management Plan has to be formulated and this planned emergency is called Disaster Management Plan.

The objective of the Industrial Disaster Management Plan is to make use of the combined resources of the plant and the outside services to achieve the following.

- Minimise damage to property and the environment.
- Effect the rescue and medical treatment of causalities.
- Provide for the needs of relatives.
- Provide authoritative information to news media.
- Secure the safe rehabilitation of affected areas.
- Safeguard other people.

Initially contain and then ultimately bring the situation under the control.

Preserve subsequent records and equipment for subsequent enquiry the cause and circumstances leading to emergency.

7.13.3 EMERGENCIES

7.13.3.1 GENERAL, INDUSTRIAL, EMERGENCIES

The emergencies that could be envisaged in the plant are as follows:

- Pool fire scenario due to storage of R.S./ENA/Ethanol.
- Contamination of food / water.
- Sabotage / social disorder.
- Structural failures.
- Slow isolated fires
- Earthquakes.

7.13.3.2 SPECIFIC EMERGENCIES ANTICIPATED

Fire consequences can be disastrous as they involve in huge quantities of fuel. During the study of risk assessment, the probabilities of occurrence of hazards are worked out along with the nature of damage. This is the reason why one should study risk assessment in conjunction with DMP.

7.13.3.3 EMERGENCY ORGANISATIONS

It is recommended to setup an Emergency Organisation. A senior executive who has control over the affairs of the plant would be heading the Emergency Organisation. He would be designated as Site Controller. In case of stores, utilities, open areas which are the not under the control of production heads, executive responsible for maintenance of utilities would be designated as Incident Controller. All the Incident Controller would be reporting to the site controller. Each Incident Controller, for himself, organises a team responsible for controlling the incidence with the personnel under his control. Shift Incharge would be the reporting Officer, who would bring the incidence to the notice of the Incidence Controller and Site Controller.

Emergency Coordinators would be appointed who would be undertake the responsibilities like fire fighting, rescue, rehabilitation, transport and support services. For this purposes, Security Incharge, Personal Department, Essential services personnel would be engaged. All these personnel would be designated as key personnel.

In each shift, electrical supervisor, electricians, pump house incharge and other maintenance staff would be drafted for emergency operations. In the event of power communication system failure, some of staff members in the office/ plant offices would be drafted and their services would be utilised as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

7.13.3.4 EMERGENCY COMMUNICATION

Whoever notices an emergency situation such as fire, growth of fire, leakage etc. would inform his immediate superior and Emergency Control Center. The person on duty in the Emergency Control Centre would appraise the site controller. Site controller verifies the situation from the Incident Controller of that area or the shift Incharge and takes a decision about an implementing on Site Emergency. This would be communicated to all the Incident Controllers, Emergency Coordinators. Simultaneously, the emergency warning system would be activated on the instructions of the Site Controller.

7.13.3.5. EMERGENCY RESPONSIBILITIES

The responsibilities of the key personnel are appended below

7.13.3.5.1 SITE CONTROLLER

On receiving information about emergency he would rush to Emergency Control Centre and take charge of ECC and the situation and assesses the magnitude of the situation on the advice of incident controller and decides.

- Whether affected area needs to be evacuated.
- Whether personnel who are at assembly points need to be evacuated.
- Declares Emergency and orders for operation of emergency siren.
- Organises announcement by public address system about location of emergency.
- Assesses which areas are likely to be affected, or need to be evacuated or are to be altered.
- Maintains a continuous review of possible development and assesses the situation in consultation with Incident Controller and other key personnel whether shutting down the plant or any section of the plant required and if evacuation of persons is required.
- Directs personnel of rescue, rehabilitation, transport, fire brigade, medical and other designated mutual support systems locally available, for meeting emergencies.
- Controls evacuation of affected areas, if the situation is likely to go out of control or effects are likely to go beyond the premises of the factory, informs to District Emergency Authority, Police, Hospital and seeks their intervention and help.
- Informs Inspector of factories, Deputy Chief Inspector of factories, APPCB and other statutory authorities.
- Gives public statement if necessary.
- Keeps record of chronological events and prepares an investigation report and preserves evidence.

On completion of on site Emergency and restoration of normalcy, declares all clear and orders for all clear warning.

7.13.3.5.2 INCIDENT CONTROLLER

- Assembles the incident control team.

- Directs operations within the affected areas with the priorities for safety to personnel minimise damage to the plant, property and environment and minimise the loss of materials.
- Directs the shutting down and evacuation of plant and areas likely to be adversely affected by the emergency.
- Ensures that all-key personnel help is sought.
- Provides advice and information to the Fire and Security officer and the local Fire Services as and when they arrive.
- Ensures that all non-essential workers / staff of the effected areas evacuated to the appropriate assembly points and the areas are searched for causalities.
- Has regard to the need for preservation of evidence so as to facilitate any enquiry into the cause and circumstances, which caused or escalated the emergency.
- Coordination on with emergency services at the site.
- Provides tools and safety equipments to the team members.
- Keeps in touch with the team and advice them regarding the method of control to be used.
- Keep the site Controller of Emergency informed of the progress being made.

7.13.3.5.3 EMERGENCY COORDINATOR - RESCUE, FIRE FIGHTING

- On knowing about emergency, rushes to Emergency Control Centre.
- Helps the incident controller in containment of the emergency.
- Ensure fire pumps in operating conditions and instructions pump house operator to be ready for any emergency, which stand arrangement.
- Guides the fire fighting crew i.e. Firemen trained plant personnel and security staff.
- Organises shifting the fire fighting facilities to the emergency site, if required.
- Takes guidance of the Incident Controller for fire fighting as well as assesses the requirements of outside help.
- Arranges to control the traffic at the gate and the incident area / Directs the security staff to the incident site to take part in the emergency operations under his guidance and supervision.

- Evacuates the people in the plant or in the near by areas as advised by site controller
- Searches for casualties and arranges proper aid for them.
- Assembles search and evacuation team.
- Arranges for safety equipments for the members of this team.
- Decides which paths the evacuated workers should follow.
- Maintains law and order in the area, and if necessary seeks the help of police.

7.13.3.5.4 EMERGENCY COORDINATOR - MEDICAL, MUTUAL AID, REHABILITATION, TRANSPORT AND COMMUNICATION.

- In the event of failure of electric supply and there by internal telephone, sets up communication point and establishes contact with the Emergency Control Center (ECC).
- Organises medical treatment to the injured and if necessary will shift the injured to near by hospitals.
- Mobilises extra medical help from outside, if necessary
- Keeps a list of qualified persons first aiding workers of the factory and seek their assistance.
- Maintains first aid and medical emergency requirements.
- Makes sure that all safety equipments are made available to the emergency team.
- Assists Site Controller with necessary data and to coordinate the emergency activities.
- Assists Site Controller in updating emergency plan.
- Maintains liaison with Civil Administration.
- Ensure availability of canteen facilities and maintenance of rehabilitation centre.
- He will be in liaison with Site Controller / Incident Controller.
- Ensures availability of necessary cash for rescue / rehabilitation and emergency expenditure.
- Controls rehabilitation of affected areas on discontinuation of emergency.
- Makes available diesel, petrol for transport vehicles engaged in emergency operation.

7.13.3.5.5 EMERGENCY COORDINATOR – ESSENTIAL SERVICES

He would assist Site Controller and Incident Controller

- Maintains essential services like Diesel Generator, Water, Firewater, Compressed Air / Instrument Air, Power Supply for lighting.
- He would plan alternate facilities in the event of power failure, to maintain essential services such as lighting, etc.
- He would organize separate electrical connections for all utilities and during emergency or fires, essential services and utilities are not affected.
- Gives necessary instructions regarding emergency electrical supply, isolation of certain sections etc. to shift Incharge and electricians.
- Ensure availability of adequate quantities of protective equipment and other emergency materials, spares etc.

7.13.3.5.6 GENERAL RESPONSIBILITIES OF EMPLOYEES DURING AN EMERGENCY

During an emergency, it becomes more enhanced and pronounced when an emergency warning is raised, the workers if they are incharge of process equipment should adopt safe and emergency shut down and attend any prescribed duty as essential employee. If no such responsibility is assigned, he should adopt a safe course to assembly point and await instructions. He should not resort to spread panic. On the other hand, he must assist emergency personnel towards objectives of DMP.

7.13.3.6 EMERGENCY FACILITIES

7.13.3.6.1 EMERGENCY CONTROL CENTRE

For the time being office block is identified as Emergency control centre. It would have external Telephone and Fax facility. All the Incident controller officers, senior personnel would be located here.

The following information and equipment are to be provided at the Emergency control centre (ECC).

- Intercom, telephone
- P&T telephone
- Fire suit / gas tight goggles / gloves / helmets
- Factory layout, site plan
- Emergency lamp / torchlight

- Plan indicating locations of hazard inventories, plant control room, locations of safety equipment, road plan, assembly points, rescue location vulnerable zones, escape routes Hazard chart
- Breathing apparatus
- Wind direction, wind velocity indications
- Public Address Megaphone, Hand bell, Telephone directories (Internal, P&T).
- Address with telephone numbers and key personnel, Emergency coordinator.
- Important addresses, telephone numbers such as experts from outside,
- Government agencies neighboring industries etc.
- Emergency shutdown procedures.
- Nominal roll of employees.

7.13.3.6.2 EMERGENCY POWER SUPPLY

Plant facilities would be connected to Diesel Generator and would be placed in auto mode.

7.13.3.6.3 FIRE FIGHTING FACILITIES

First Aid Fire fighting equipment suitable for emergency should be maintained as per stationary requirements as well as per TAC Regulations. Fire hydrant line converting major areas would be laid. It would be maintained as 6 kg / sq. cm. Pressure.

7.13.3.6.4 LOCATION OF WINDSOCK

On the top of each main block and on the top of administrative block wind sock would be installed to indicate direction of wind during emergency period.

7.13.3.6.5 EMERGENCY MEDICAL FACILITIES

Gas masks and general first aid materials for dealing with chemical burns, fire burns etc. would be maintained in the medical centre as well as in the emergency control room. Private medical practitioners help would be sought. Government hospital would be approached for emergency help.

Apart from plant first aid facilities, external facilities would be augmented. Names of Medical Personnel, Medical facilities in Nandigama town would be prepared and updated. Necessary

specific medicines for emergency treatment of Burns patients, and for those affected by toxicity would be maintained.

Breathing apparatus and other emergency medical equipment would be provided and maintained. The help of near by industrial managements in this regard would be taken on mutual support basis.

7.13.3.7 EMERGENCY ACTIONS

7.13.3.7.1 EMERGENCY WARNING

Communication of emergency would be made familiar to the personnel inside the plant and people outside. An emergency warning system would be established.

7.13.3.7.2 EMERGENCY SHUTDOWN

There are number of facilities which can be provided to the help deal with hazard conditions. The suggested arrangements are

- Stop feed
- Deluge contents
- Remove heat
- Transfer contents

7.13.3.7.3 EVACUATION OF PERSONNEL

The area would have adequate number of exits, staircase. In the event of an emergency unconnected personnel have to escape to assembly point. Operators have to take emergency shutdown procedure and escape. Time office maintains a copy of deployment of employees in each shift at Emergency Communication Centre. If necessary, persons can be evacuated by rescue teams.

7.13.3.7.4 ALL CLEAR SIGNAL

At the end of emergency, after discussing with Incident Controllers and Emergency Coordinators, the site controller orders an all clear signal.

7.14 OCCUPATIONAL HEALTH: [GENERIC TOR # 8 i, ii & iii & iv]

In large scale industries where multifarious activities are involved during construction, erection, testing, commissioning, operation and maintenance, the men, materials and machines are the basic inputs. Along with the booms, the industrialization generally brings several problems like

occupational health and safety. Occupational health needs attention both during construction and operation phases. However the problem varies both in magnitude and variety in the above phases.

7.14.1 CONSTRUCTION & ERECTION

The occupational health problems envisaged at this stage can be mainly due to constructional accident and noise.

To overcome these hazards, in addition to arrangements to reduce it within TLV'S, personnel protective equipments should also be supplied to workers.

7.14.2 OPERATION & MAINTENANCE

The working personnel are provided with the following appropriate personnel protective equipments.

- Industrial Safety helmets
- Crash helmets
- Face shield with replacement acrylic vision
- Zero power plain goggles with cut type filters on both ends
- Zero power goggles with cut type filters on both sides and blue colour glasses
- Welders equipment for eye and face protection
- Cylindrical type earplug
- Ear plugs
- Canister gas masks
- Self contained breathing apparatus
- Leather apron
- Boiler suit
- Safety belt / line man's safety belt
- Leather hand gloves
- Asbestos hand gloves
- Canvas cum leather hand gloves with leather palm
- Industrial safety shoes with steel toe
- Electrical safety shoes without steel toe and gum boots

7.14.3 OCCUPATIONAL HEALTH SURVELLIANCE

Occupational Health Surveillance (OHS) is under taken as regular exercise for all the employees specifically for those engaged in handling hazardous substances. All the first aid facilities have been provided in the Occupational Health Centre. The medical records of each employee is being maintained separately and similar system will be continued after the expansion also.

Occupational health centre for medical examination of employees with all the basic facilities will be established with in the plant. The noise levels in critical area will be monitored regularly and the workers at high noise level generating areas should undergo audiometric tests once in six months.

Anticipated Occupational & Safety Hazards

- Heat Stress & Stroke
  - ✓ Physical activity
  - ✓ Extremes of age, poor physical condition, fatigue
  - ✓ Excessive clothing
  - ✓ Dehydration
  - ✓ Cardiovascular disease
  - ✓ Skin disorders
- Noise
- Dust Exposure
- Illumination
- Burns and shocks due electricity

EMP for the Occupational Safety & Health hazards

The health of workers can be protected by adopting the following measures:

- Proper Designing of building, Work area.
- Relaxation facilities to workers with good ventilation & air circulation. This will help in relieving of thermal stress.
- Good Housekeeping practices.
- Well engineered ventilation & exhaust system.
- Enclosure.

- Isolation of specific areas
- Enforcement of usage of Personal Protective Devices.
- Regular Work Environment Monitoring
- Statistical Monitoring
- Working hours
- Rotation of employees in specific areas to avoid continuous exposure

Frequency Of Periodical Examination:

Medical check-up is being carried to employees every year. Those employees who have health issues like hypertension, diabetic, etc. are checked every six months.

Plan of pre placement and periodical health status of workers:

Pre-employment checkup will be made mandatory and following test will be conducted:

- Plan of evaluation of health of workers
- Chest x rays
- Audiometry
- Spirometry
- Vision testing (Far & Near vision, color vision and any other ocular defect)
- ECG
- Haemogram (examination of the blood)
- Urine (Routine and Microscopic)
- Complete physical examination
  - Musculo-skeletal disorders (MSD)
  - Backache
  - Pain in minor and major joints
  - Fatigue, etc.
- Medical records of each employee is being maintained separately and updated as per findings during monitoring.
- Medical records of the employee at the end of his / her term will be updated.

7.15 SAFETY PLAN

Safety of both men and materials during construction and operation phases is of concern. The preparedness of an industry for the occurrence of possible disasters is known as emergency plan. The disaster in any plant is possible due to collapse of structures and fire / explosion etc

Keeping in view the safety requirement during construction, operation and maintenance **M/s. Crux Biotech India Private Limited** has formulated safety policy with the following regulations.

- To take steps to ensure that all known safety factors are taken into account in the design, construction, operation and maintenance of plants, machinery and equipment.
- To allocate sufficient resources to maintain safe and healthy conditions to work.
- To ensure that adequate safety to instructions are given to all employees.
- To provide protective equipment, safety appliances and clothing and to ensure their proper use.
- To inform employees about materials, equipments or processes used in the work, which are known to be potentially hazardous to health or safety?
- To promote the established machinery, joint consultation in health and safety to ensure effective participation by all employees.
- To keep all operations and methods of work under regular review for making necessary changes from the point of view safety in the light of experience and upto date knowledge.
- To provide appropriate facilities for first aid and prompt treatment of injuries and illness at work.
- To provide appropriate instructions, training and supervision to employees' health and safety, first aid and to ensure that adequate publicity is given to these matters.
- To ensure proper implementation of fire preventive methods and an appropriate fire fighting service together training facilities for personnel involved in this service.
- To publish / notify regulations, instructions and notices in the common language of employees.

- To prepare separate safety rules for each type of process involved.
- To ensure regular safety inspection by a competent person at suitable intervals of all buildings, equipments, work places and operations.

7.15.1 SAFETY ORGANISATION

7.15.2 CONSTRUCTION AND ERECTION PHASE

A qualified and experienced Environment Health & Safety (EHS) officer has been appointed. The responsibilities of the safety officers include identification of the hazardous conditions and unsafe acts of workers and advice on corrective actions, conduct safety audit, organize training programmes and provide professional expert advice on various issues related to Occupational Safety and Health.

7.15.3 OPERATION & MAINTENANCE PHASE

Safety officer already appointed is performing duties in accordance with the requirement of factories act.

7.15.4 SAFETY CIRCLE

In order to fully develop the capabilities of the employees in identification of hazardous processes and improving safety and health, safety circles would be constituted in each area of work. The circle would consist of 5-6 employees from that area. The circle normally should meet for about an hour every week.

7.15.5 SAFETY TRAINING

Safety training is being provided by the safety officers to all the employees with the assistance of faculty members called from professional safety institutions and universities. In addition to regular employees, limited contractor labours are also provided with safety training.

To create safety awareness safety films will be shown to workers and leaflets etc. will be distributed.

- Compartmentalization of the cable galleries, use of proper sealing techniques of cable passages and crevices in all directions would help in localising and identifying the area of occurrence of fire as well as ensure effective automatic and manual fire fighting operations.

- Spread of fire in horizontal direction would be checked by providing fire stops for cable shafts.
- Reliable and dependable type of fire detection system with proper zoning and interlocks for alarms
- Housekeeping of high standard helps in eliminating the causes of fire and strengthens fire prevention and fire fighting.

7.15.6 HEALTH AND SAFETY MONITORING PLAN

The potential occupational hazardous work places are being monitored regularly. The health of employees working in these areas is being monitored once in a year.

7.16 SOCIAL IMPACT ASSESSMENT

There will be no construction work due to the capacity enhancement proposal. Hence no requirement of construction labour and no additional employment due to the enhancement proposal.

The project proponent is conducting regular health checkups in the surrounding villages. Therefore, there will be a certain enhancement of medical standards of people in the study area. There will be generally positive and beneficial impacts by way of economic improvements, transportation, aesthetic environment and business generation. There will be an overall upliftment of socio-economic status of people in the area. CSR activities and will be taken up as per need based assessment in village panchayat. Detailed break-up of CSR activities is specified in Chapter -8.

7.17 R & R ACTION PLAN

The present enhancement proposal will be taken up within the existing plant premises only. Hence no Rehabilitation & Resettlement Action Plan has been envisaged for the present proposal.

CHAPTER – 8
PROJECT BENEFITS

8.1 PHYSICAL INFRASTRUCTURE

The existing plant is in operation from 2015 and has contributed to the development of the area by way of CSR activities. After commissioning of the existing plant socio-economic status of the local people has been improved and also contributed to the development of infrastructural facilities. The road net connectivity to the villages on the road connecting to the plant has improved during operation of the existing plant. Similar practice will be continued after expansion also.

8.2 SOCIAL INFRASTRUCTURE

After establishment of the existing 60 KLPD plant, the socio-economic status of the local people has improved. Land rates in the area have improved in the nearby areas due to the establishment of the plant. This has helped in upliftment of the socio status of the people in the area. Company has contributed to improvement in educational status of the people in the area.

Similar pattern will be followed after commencement of expansion also and contribute to the overall development of the village.

8.3 EMPLOYMENT POTENTIAL

There will not be any increase in employment due to the capacity enhancement. The existing plant created employment to 150 people.

8.4 SOCIO-ECONOMIC DEVELOPMENTAL ACTIVITIES: [GENERIC TOR # 11 i]

CSR activities are being taken up by the existing plant in consultation with village panchayats. The following are the CSR activities undertaken and expenditure in the last 2 years.

S.No	CSR Activity	Expenditure (Rs. in Lakhs)
1	Development of Peddavaram Village Road and Maintenance (2015-16)	4.50
2	Development of Temples in Peddavaram Village (2016-17)	3.70

3	Plantation Programme in Peddavaram Village (2016-17)	1.00
4	School books, Bags and providing basic amenities to MPP school childrens in Peddavaram village. (2016-17)	2.00
5	Development of Temples in Peddavaram Village (2017-18)	1.00
6	Peddavaram Village roads maintenance drive (2017-18)	3.00
7	School books, Bags and providing basic amenities to MPP school children's in Peddavaram and Cherukumpalem village. (2017-18)	3.00
Total		**18.20**

Crux Biotech India Private Limited will contribute to improve the Socio economic conditions of the area. Total project cost for 75 KLPD plant is Rs. 99.50 crores. A budget of Rs. 249 Lakhs will be allocated for conducting CSR activities in the surrounding villages. The following activities will be taken up:

No.	Description	Expenditure Rs.In Lakhs		I Year	II Year	III Year	IV Year	V Year	Total
1.	Education	**40.0**	Year Wise Budget	8.0	8.0	8.0	8.0	8.0	**40.0**
2.	Health	**39.0**		8.0	8.0	8.0	8.0	7.0	**39.0**
3.	Training of village women self-help groups	**20.0**		4.0	4.0	4.0	4.0	4.0	**20.0**
4.	Providing drinking water plants	**20.0**		4.0	4.0	4.0	4.0	4.0	**20.0**
5.	Toilets and sanitation	**20.0**		4.0	4.0	4.0	4.0	4.0	**20.0**
6.	Vocational training programme	**20.0**		4.0	4.0	4.0	4.0	4.0	**20.0**
7.	Recreation	**20.0**		4.0	4.0	4.0	4.0	4.0	**20.0**
8.	Sports & Games	**20.0**		4.0	4.0	4.0	4.0	4.0	**20.0**
9.	Contribution to development of Agriculture	**20.0**		4.0	4.0	4.0	4.0	4.0	**20.0**
10.	Village infrastructure	**30.0**		6.0	6.0	6.0	6.0	6.0	**30.0**
		249		50.0	50.0	50.0	50.0	49.0	**249**

CHAPTER – 9

ENVIRONMENTAL COST BENEFIT ANALYSIS

- No specific TOR has been issued by MOEF&CC pertaining to Environmental Cost Benefit Analysis.
- The existing boiler is adequate after expansion also. Hence there will not be any increase in air emissions due to the proposed capacity enhancement.
- There is no increase in spent wash quantity. Hence existing spent wash treatment comprising of Multiple Effect Evaporation followed by Drying system is adequate after capacity enhancement also.
- DDGS generated will be used as cattle feed.
- In the existing plant all the required Environmental protection measures have been installed and is being operated duly complying with the MOEF/CPCB/APPCB norms. No additional environment protection measures are envisaged due to the enhancement, as the existing systems are adequate after expansion also.

CHAPTER – 10

ENVIRONMENTAL MANAGEMENT PLAN

10.1 INTRODUCTION [GENERIC TOR # 3 vi & 10]

The major objective and benefit of utilising Environmental Impact Assessment in project planning stage itself is to prevent avoidable losses of environmental resources and values as a result of Environmental Management. Environmental Management includes protection/mitigation/ enhancement measures as well as suggesting post project monitoring programme. Environmental management may suggest revision of plant site or operation to avoid adverse impacts or more often additional project operations may have to be incorporated in the conventional operation.

Environment Management Plan (EMP) is required to ensure sustainable development in the study area of the plant. Hence it needs to be an all encompassive plan for which the proposed industry, Government, Regulating agencies like Pollution Control Board working in the region and more importantly the affected population of the study area need to extend their cooperation and contribution.

It has been evaluated that the study area is likely to get further economical fillip. The affected environmental attributes in the region are air quality, water quality, soil, land use, ecology and public health.

The Management Action Plan aims at controlling pollution at the source level to the possible extent with the available and affordable technology followed by treatment measures before they are discharged. Environmental Management aims at the preservation of ecosystem by considering the pollution abatement facilities at the plant inception. In the upcoming modern distillery plants, pollution abatement has become an integral part of planning and design along with Techno economic factors.

10.2 MANAGEMENT DURING CONSTRUCTION PHASE: [GENERIC. TOR # 10]

Existing 60 KLPD grain based distillery has obtained EC in 2012 and is in operation from the year 2015. Now it has been proposed to increase the distillery plant capacity from **60 KLPD to 75 KLPD**

by making suitable process modifications and without installing any additional machinery in the same existing 28.98 acres of land for which EC has been accorded.

No construction activity has been envisaged in the enhancement of the production capacity, as it will be achieved by making suitable process modifications. Hence there will be no adverse impact on environment during construction phase as no construction activity is required.

10.3 POST CONSTRUCTION PHASE

10.3.1 AIR EMISSION MANAGEMENT: [GENERIC. TOR # 7 v & vi]

The steam requirement for the 75 KLPD will be sourced from the existing 25 TPH boiler which is being operated with imported/indian coal / Biomass as fuels**.** Bag filters have been provided to treat the flue gases from the boiler to bring down the particulate matter in the exhaust gas to less than 50 mg/Nm^3. Stack height of 45 Meter has been attached to the Boiler for effective dispersion of sulphur dioxide emissions into the atmosphere. Existing Boiler is adequate for 75 KLPD capacity. Existing Air emission control systems are adequate after capacity enhancement also.

10.3.1.1 MONITORING OF SECONDARY FUGITIVE EMISSIONS

Fugitive emissions will be monitored as per CPCB guidelines and the norms of the Ministry of Environment & Forests.

Secondary fugitive emissions generated at fuel unloading points, fuel transfer points, etc.. These emissions will be monitored regularly as per CPCB guidelines & the reports will be submitted to the Regional office of MOEF&CC & APPCB.

The following measures will be taken up to prevent the fugitive dust emissions

- Raw material/fuel unloading areas provided with dust suppression system.
- All material transfer points provided with dust extraction system with bagfilters.
- All the conveyers covered with sheets to prevent the fly-off of fugitive dust.
- All internal roads are made pucca to prevent the fugitive dust to vehicular movement.
- There is no open storage of ash and the ash is being stored in silo only.

The emission level have been maintained below the stipulated standards. In the event of failure of any pollution control system adopted by the unit, the respective unit will not be restarted until the control measures are rectified to achieve the desired efficiency.

Implemented following Recommendations

a) Boiler stack emissions are being monitored for PM, SO_2 and NOx regularly to meet the statutory requirements and will be continued after enhancement also.

b) All the internal roads are already asphalted to reduce the fugitive dust due to truck movement.

10.3.2 WASTEWATER MANAGEMENT: [GENERIC TOR # 7 iv]

A) PROCESS EFFLUENT TREATMENT AND DISPOSAL

The spent wash generation quantity from 60 KLPD plant is 260 KLD (less than 6 KL/KL of RS production).

SPENTWASH TREATMENT :

- ✓ Spent wash after recycling will be less than 6 KL/KL of Alcohol production through higher Fermentation efficiency. Thin slop is partly recycled into Flour in Liquefaction process and partly taken to MEE for concentration to 30-35% w/w syrup to be further mixed in Wet Cake.
- ✓ Spent Wash first centrifuged in Decanters to form Wet Cake (~ 30% solids w/w) and Thin Slops are collected and recycled to process & to MEE for concentration, as mentioned above.
- ✓ The Thin Slops are concentrated in Multiple Effect Evaporators upto 30-35% w/w and then taken to a DDGS Dryer mixed along with Wet Cake from Decanters. This Wet Cake+Syrup is mixed & Dried upto 90% w/w Solids and then sold as Protein Rich Cattle feed. Protein content in such Cattle Feed ranges from 35% - 40% w/w depending upon protein available in grains.
- ✓ This is totally a "Zero Effluent Discharge" based proven technology, as also approved by the Central Pollution Control Board (CPCB) and The Ministry of Environment, Forest & Climate Change.

DECANTATION OF SPENT WASH

Spent wash from mash column bottom is fed to decanter centrifuge after cooling in fermented mash pre-heater. The decanter seperates the solids present in the spent mash to desired level.

The wet cake is separated in decanter at 30% solids. This wet cake will be mixed with concentrated thin slop for further concentrating in Dryer.

EVAPORATION PROCESS

The objective of Evaporation is to concentrate a solution consisting of a volatile solute and a volatile solvent. Evaporation is conducted by vaporizing a portion of the solvent to produce a concentrated solution of thick slop with 30-35% solids and 65-70% moisture content.

The evaporation system consists of 5 evaporators, which are connected, in series. The thin slop separated from decanter will be pumped to evaporator by using feed pump. Gas Liquid separator (5 Nos.) will be used to separate the vapor and liquid. Both Vapor & Spent wash will be fed to the next evaporation effect. Hence it is called as Feed Forward Effect Evaporation. The vapor from last evaporator will be condensed in condenser. While vacuum pump maintains vacuum in the entire system. Product final thick slop with 30-35% solids will be transferred to the drying system where it is further concentrated to 90 % solids. The condensate from evaporation is being recycled.

DRYING PROCESS

The wet cake from the Decanter and the concentrated syrup with 30-35% solids from the Evaporator is dried in a steam tube bundle dryer to produce a dry powder called Distillers Dried Grain Soluble (DDGS) with 10% moisture and 90% solids, which is being sold as cattle feed. It is totally a zero spent wash discharge process, which is in accordance with the CPCB recommendations. It is hereby confirmed that Dryer will be installed in the plant.

There will be no additional spent wash generation from the proposed expansion project from 75 KLPD plant. Hence existing spent treatment plant is adequate for expansion capacity also. Spentwash treatment process flow diagram is shown as fig-10.1

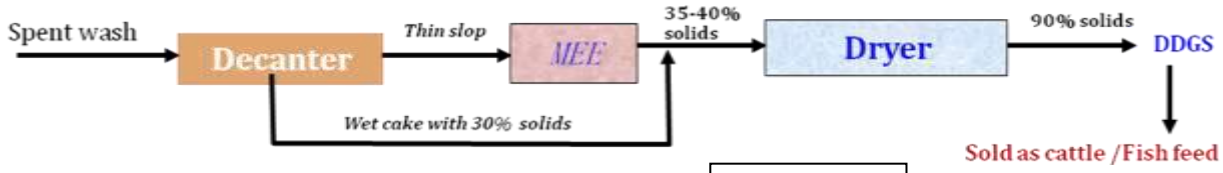


Fig- 10-1

STORAGE OF SPENTWASH

Spent wash is being stored in MS tanks with a storage capacity in accordance with CPCB norms. Peizometers will be provided around the spent wash storage tank. This will help in detecting any contamination of ground water.

PROCESS CONDENSATE TREATMENT

Evaporator condensate & spent lees are being treated in a Treatment plant and the treated condensate is used back to process.

B) NON-PROCESS EFFLUENT TREATMENT AND DISPOSAL

Total Non process effluent from project : 169 KLD (excluding sanitary wastewater of 8 KLD).

Boiler Blowdown, CT Blow down & WTP rejects is being treated ETP.

EFFLUENT DISPOSAL

The boiler blow down will be used as cooling tower makeup & CT Blow down will be sent to ETP. The scrubbed water from CO_2 recovery Plant will be utilized in the Fermentation section. Non process effluents (WTP waste) will be treated in ETP and after ensuring compliance with CPCB/APPCB standards, the treated effluent will be utilised for dust suppression, ash conditioning and for greenbelt development. Sanitary waste water is being treated in septic tank followed by subsurface dispersion.

Implemented following Recommendations

a) Minimize the quantity of effluent through reuse to the maximum possible extent.
b) The ETP units taken up for maintenance, when ever for main plant is taken for maintenance.
c) Inlet and outlet effluent samples are collected monthly and analyzed to ascertain the compliance with the statutory requirements.

10.3.3 SOLID WASTE GENERATION & DISPOSAL METHOD: [GENERIC TOR # 7 vii & viii]

The following are the solid waste generation & disposal:

S.No.	Solid waste	Total Quantity (TPD)		Disposal
		60 KLPD	75 KLPD	
1.	DDGS (with 90% solids)	53	58	Is being sold as cattle/poultry/fish feed

2.	Boiler Ash	27 (with 100% Biomass) (or) 45 (with 100% coal)	Ash generated is being given to brick manufacturers when biomass is used as fuel. Ash generated is being given to brick manufacturers/cement plants when coal is used as fuel.

10.3.4 NOISE LEVEL MANAGMENT

The major sources of noise generation are STG, Boiler, compressors & DG set. The Steam turbine Generator is of internationally reputed make which has been manufactured as per MOEF/OSHA/other international guidelines on noise levels. Acoustic enclosures have been provided to STG, DG set. The major noise levels are confined to the working zones of the plant. The Leq of eight hours will be within the prescribed standards. Community noise levels are not likely to be effected due to the proposed capacity enhancement as no additional plant & machinery are proposed to be added.

Implemented following Recommendations

a) Acoustic enclosures provided to STG, DG set.
b) By adopting shock-absorbing techniques noise impact is reduced.
c) Earplugs provided to the workers and this is being enforced strictly.
d) Increase the distance between source and receiver, by altering the relative orientation of receiver and the source.
e) Rotation of workers working in the noise prone areas.
f) Greenbelt developed is attenuating noise levels.

10.3.5 LAND ENVIRONMENT

Existing Boiler is adequate after enhancement also. Hence no increase in air emission due to the present proposal. Hence there will not be any adverse impact on land environment due to the present proposal. The spent wash treated in decanter followed by MEE and then in Dryer to obtain dry powder called DDGS which is being used as cattle feed. In existing plant zero liquid discharge is complied. As there will be no increase in effluent due to the proposed capacity enhancement, the existing ETP is adequate for 75 KLPD capacity also. Hence zero liquid discharge will be followed

after capacity enhancement. Hence there will not be any impact on land environment due to the effluent generated. The solid waste will be disposed off as per the norms of CPCB/APPCB. More than 1/3rd of the area has already been developed with greenbelt. The land prices in the area have increased due to the plant. After capacity enhancement, this might further increase.

10.3.6 ODOUR CONTROL MEASURES

The following measures help in minimizing the odour.

- Covered Fermentation process adopted along with CO_2 recovery
- Spent wash transported through pipes only.
- The spent wash storage in accordance with CPCB norm of less than 30 days.
- Spent wash treated in decanter initially, then thin slop is concentrated, dried and the dry powder (DDGS) obtained is used as cattle feed.
- Wet cake will not be stored for more than 36 hours to prevent odour generation
- 10 m wide greenbelt already developed covering more than 1/3rd of the total area.

10.3.7 GREEN BELT DEVELOPMENT: [GENERIC TOR # 7 ix]

Greenbelt has already been developed in the existing plant in 9 acres. The greenbelt developed is further mitigating the air emissions and noise levels. 10 m wide greenbelt has been developed all round the plant. Total number of plants in existing plant: 5,800. The following is the break-up of plant species with nos. in the existing plant.

S.NO	NAME OF THE PLANT	NUMBERS
1	Subabul	1500
2	Millettia	1000
3	Neem	600
4	Green Assamese	500
5	Teek	300
6	Maddi	600
7	Black Plum plant	500

8	Kanuga	400
9	peltophorum	400
	TOTAL	5,800

10.3.8 RAINWATER HARVESTING: [GENERIC TOR # 7 x]

Rainwater harvesting pits have been constructed to harvest the run-off water from roof top by laying a separate storm water drainage system for recharging of ground water in consultation with the State Ground Water Board.

The water conserved will be used to meet the plant water requirement. Rain water harvesting and groundwater recharge structures also will be constructed outside the plant premises in consultation with local Gram Panchayat and Village Heads to augment the ground water level.

10.4 POST PROJECT MONITORING STRATEGY: [GENERIC TOR # 7 xii]

The monitoring of various environmental parameters is necessary, which is one of a part of environmental protection measures. Monitoring is an important feature because the efficiency of control measures can only be determined by monitoring. A comprehensive monitoring programme is given under.

Locations and frequency of monitoring as per the guidelines of APPCB and MOEF are tabulated below.

MONITORING SCHEDULE FOR ENVIRONMENTAL PARAMETERS

S.NO	PARTICULARS	FREQUENCY OF MONITORING	DURATION OF SAMPLING	PARAMETERS REQUIRED TO BE MONITORED
1. Water quality				
	Water and waste water Quality a) Industrial Effluents. b. Ground water Quality (Peizometric wells around spent wash storage area, ETP)	Online Once in a month	continuous Grab sampling	pH, EC, TDS, BOD, COD, Cl, SS, Sulphates As per BIS: 10500
2. Air Quality				
A.	Stack Monitoring	Continuous Online		PM

S.NO	PARTICULARS	FREQUENCY OF MONITORING	DURATION OF SAMPLING	PARAMETERS REQUIRED TO BE MONITORED
		monitoring Once in a month		 SO_2 & NOx
B.	Ambient Air quality	CAAQMS	24 hours continuously	PM_{10}, $PM_{2.5}$, SO_2 , NOx & CO
3. Meteorological Data				
	Meteorological data to be monitored at the plant.	Daily	Continuous monitoring	Temperature, Relative Humidity, rainfall, wind direction & wind speed.
4. Noise level monitoring				
	Ambient Noise levels	Twice in a year	Continuous for 24 hours with 1 hour interval	

Infrastructure for Environmental Protection

Environment Health & Safety officer

One person has been appointed as EHS officer. He is responsible for implementing and monitoring the environmental impacts and all the safety aspects. He is a laisioning officer between the industry and the regulatory agencies like APPCB, CPCB etc.

10.5 COST FOR ENVIRONMENTAL PROTECTION: [GENERIC TOR # 7 xi]

Total project cost of the Expansion project in Rs. : Nil

Capital Cost for Environment Protection for proposed Expansion in Rs. : Nil

(As all existing environment protection measures are adequate for 75 KLPD)

Recurring Cost for Environmental protection per annum (for expansion)in Rs. : Nil

CHAPTER – 11
SUMMARY & CONCLUSION

[GENERIC TOR # 1]

11.1 DESCRIPTION OF THE PROJECT

Crux Biotech India Private Limited is an existing grain based distillery plant of 60 KLPD capacity & 2.5 MW power plant in Sy.Nos.529 p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh, the existing plant is having land of 28.98 acres with a valid Consent to Operate (CTO) from A.P. Pollution Control Board. Now the company proposed to enhance the distillery plant capacity from 60 KLPD to 75 KLPD capacity in the same existing plant premises by making process modifications. The following are the details pertaining to the present proposal.

1	Proposed Plant capacities	:	**Grain based Distillery Plant :** Expansion from 60 to 75 KLPD
2	Main Products	:	Rectified Spirit/ENA/ Ethanol – Exp from 60 to 75 KLPD
3	Raw materials/fuel		1) Grains - 200 TPD (for 75 KLPD Distillery) **Fuel for Boiler** 2) Imported Coal - 70 TPD **(or)** Indian coal - 115 TPD **(or)** Biomass - 135 TPD
4	Source of water		Water requirement for the existing 60 KLPD plant is being sourced from Krishna river & Ground Water sources. Water drawl permissions has already been obtained from Govt. of Andhra Pradesh for river and ground water. With the present enhancement proposal the total water requirement is not increasing.
5	Water requirement		Water requirement for 60 KLPD distillery at the time of Environmental clearance in 2012 is 642 KLD. However No increase in water requirement due to capacity enhancement and it remains 642 KLD for 75 KLPD capacity also.
6.	Boiler details		Existing plant is having 25 TPH Boiler and same adequate for expansion project

11.2 ENVIRONMENTAL SETTING OF THE PLANT SITE

The following are the salient features of the plant site:

- The plant area does not fall under the industrial areas / cluster, which are listed in MoEF office memorandum dated 13th January 2010 and its subsequent amendments for Critically Polluted area.
- Nearest Habitation peddavaram is at a distance of 1.6 Kms. from the plant site.
- There are no National Parks/Wild life sanctuaries/Tiger Reserves/Elephant corridors within10 Km. radius of the plant site.
- No historical places and places of tourist importance within 10 Km radius of the plant site.
- Krishna river is flowing at a distance of 1.3 Kms. & Nagarjuna Sagar Left Bank Canal-3.4 Kms. from the plant site.
- There is no interstate boundary with 5 Km. radius of the plant site. Nearest interstate boundary is Telangana is at distance of 10.1Km. from the plant site.
- The following reserve forests are situated within 10 Km. radius from the plant site.

  A) Venkataya Palem RF _ 2.3 Kms.

  B) Jaggayyapeta RF – 2.4 Kms.

  C) Gudimetla RF – 4.1 Kms.

  D) Gingupalle RF- 4.1 Kms.

  E) Kuntimaddi RF – 5.0 Kms.

11.3 ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

Environmental impact	Mitigation measures
Impact due to air pollution on nearest habitation	The nearest habitation is Peddavaram at a distance of 1.6 Kms. from the plant. Bagfilters have been provided as air emission control system to brindown the PM in the exhaust gases of boiler to less than 50 mg/Nm^3. Stack height of 45 Meter height has been provided for effective dispersion of SO_2 emissions into the atmosphere. The following systems have been provided to control fugitive emissions • Dust suppression system at unloading areas.

Environmental impact	Mitigation measures
	• Conveyers covered with sheets. • Material transfer points provided with dust extraction system with bagfilters. • Pucca internal roads Existing Boiler is adequate for 75 KLPD also. Hence there will not be any increase in air emissions due to the present proposal. The net resultant GLCs due to the air emissions will be within the NAAQS. All aforementioned systems have already been installed and operated to comply with the norms. Hence there will not be any adverse impact on Peddavaram village due to the 75 KLPD distillery plant.
Ground water pollution	In the existing 60 KLPD plant, Spent wash (6 % w/w solids) is initially being treated in a decanter and the supernatant will be concentrated in the Multilple Effect Evaporators (MEE) up to 30-35% solids (w/w). This concentrated spent wash is sent to the drier along with wet cake generated from Decanter and the output is dry powder with 90% solids and is known as DDGS. This DDGS is being used as cattle feed/fish feed. Thus zero liquid discharge systems has been implemented for spent wash in accordance with CPCB stipulation. The non process effluent is being treated in ETP and utilized for Process, CT makeup greenbelt development after ensuring compliance with MoEF / SPCB norms. Spent wash is stored in covered MS tanks. Hence no contamination due to storage of spent wash. There will be no increase in waste water due to the proposed capacity enhancement. Peizometers will be installed near the spent wash storage tank to monitor the ground water quality periodically. This will help in detection of any ground water pollution.
Odour nuisance	**Odour control measures**: • Covered Fermentation process is being adopted along with CO_2 recovery • Spent wash is being transported through pipes

Environmental impact	Mitigation measures
	only. • The spent wash storage is in accordance with CPCB norms. • Spent wash generated is being treated in decanter initially, then thin slop will be concentrated, dried and the dry powder (DDGS) obtained is used as cattle Feed. • Wet cake is not being stored for more than 36 hours to prevent odour generation.
Water table depletion	Water required for the existing plant operations is being sourced from Krishna river & Ground water. Water drawl permission has been obtained from GOAP. There will be no increase in water requirement due to the proposed capacity enhancement. Rain water harvesting will be taken in the plant premises and in the nearby villages also. This will help in augmentation of ground water table. Hence there will not be any significant impact on ground water table due to the proposed capacity enhancement.
Impact on downstream users of Muniyeru river.	Water required for the plant operations is being sourced from Krishna river & Ground water. Water drawl permission has been obtained from GOAP duly considering the requirements in the downstream such as drinking, irrigation, industrial requirement, etc. There is no increase in water requirement due to the proposed enhancement. Hence there will not be any significant impact on downstream users of Krishna river due to water drawl from river.

11.4 ENVIRONMENTAL MANAGEMENT PLAN

1.	Air Emission Control systems proposed & outlet emissions guaranteed		**Boiler** : Emission control systems for treatment of flue gases from the 25 TPH Boiler are Bag filters. PM emission : < 50 mg/Nm^3 Stack Height : 45 Meter (as per CPCB norms) **Fugitive Emission control measures** : - Dust suppression system at unloading areas. - Covered Conveyers.

			- Material transfer points provided with dust extraction system with bagfilters. - Pucca internal roads **Odour control measures**: ➢ Covered Fermentation process along with CO_2 recovery ➢ Spent wash transportation through pipes only. ➢ The spent wash storage as per CPCB norms. ➢ Spent wash treated in decanter initially , then thin Slop is concentrated, dried and the dry powder (DDGS) obtained is used as cattle feed. This whole treatment process will be carried out in closed condition.
2.	Wastewater management		In the existing 60 KLPD plant, Spent wash (6 % w/w solids) is initially being treated in a decanter and the supernatant will be concentrated in the Multilple Effect Evaporators (MEE) up to 30-35% solids (w/w). This concentrated spent wash is sent to the drier along with wet cake generated from Decanter and the output is dry powder with 90% solids and is known as DDGS. This DDGS is being used as cattle feed and fish feed. Thus zero liquid discharge systems has been implemented for spent wash in accordance with CPCB stipulation. The non process effluent is being treated in ETP and utilized for Process, CT makeup greenbelt development after ensuring compliance with MoEF / SPCB norms. There will be no increase in waste water due to the proposed capacity enhancement. Existing ETP is adequate for 75 KLPD plant also.
3	Noise Control measures		All plant and machinery are manufactured keeping inview the MOEF norms on noise control, OSHA standards. Acoustic enclosures have been provided to STG & DG set. Extensive green belt will help in attenuation of noise levels. No additional plant and machinery are envisaged for enhancement.
4	Solid waste disposal		a) Ash generated is being used as manure when Biomass is used as fuel. (or) Ash generated is being given to brick manufacturers/cement plants when coal is used as fuel.

			b) DDGS is sold as cattle feed and fish feed.
5	Green belt development		1/3rd of the plant area is developed with Greenbelt in the plant premises.

11.5 ENVIRONMENTAL MONITORING PROGRAM

S.NO	PARTICULARS	FREQUENCY OF MONITORING	DURATION OF SAMPLING	PARAMETERS REQUIRED TO BE MONITORED
1. Water quality				
	Water and waste water Quality a) Industrial Effluents. b. Ground water Quality (Peizometric wells will be located around spent wash storage area, ETP)	Online Once in a month	continuous Grab sampling	pH, EC, TDS, BOD, COD, Cl, SS, Sulphates As per BIS: 10500
2. Air Quality				
A.	Stack Monitoring	Continuous Online monitoring Once in a month		PM SO_2 & NOx
B.	Ambient Air quality	AAQMS	24 hours continuously	PM_{10}, $PM_{2.5}$, SO_2 , NOx & CO
3. Meteorological Data				
	Meteorological data to be monitored at the plant.	Daily	Continuous monitoring	Temperature, Relative Humidity, rainfall, wind direction & wind speed.
4. Noise level monitoring				
	Ambient Noise levels	Twice in a year	Continuous for 24 hours with 1 hour interval	

11.6 PUBLIC CONSULTATION

Public consultation has been exempted under 7 (ii) of EIA Notification, 2006 and its amendments.

11.7 PROJECT BENEFITS

The following will be the action plan for CSR activities.

Total Cost of the 60 KLPD plant: Rs 99.95 Crores (No additional cost involved for expansion proposal).

CSR Budget @2.5% : Rs 2.49 Crores

This amount will be spent over a period of 5 years

11.8 SOCIAL IMPACTS

No R & R is involved. CSR activities will be taken up in consultation with local panchayats. Local people will be given priority in employment.

CHAPTER – 12
DISCLOSURE OF CONSULTANTS

12.0 DISCLOSURE OF CONSULTANT ENGAGED

PIONEER ENVIRO LABORATORIES & CONSULTANTS (P) LTD is QCI-NABET accredited & ISO 9001-2008 certified company. It is one of the leading Environmental Consultancy organizations in South India and Chhattisgarh. Established in 1996 **PIONEER ENVIRO** has an excellent track record of serving several well established Group companies across the Country.

PIONEER ENVIRO is a team of professionals in various disciplines such as Environmental Engineering & Environmental Management. The team is slated to double in next two years.

Our goals are to provide all of our clients with quality services at a fair, competitive price. By offering a turnkey service (excepting some specific areas), we can maximize the efficiency of data collection so that our clients pay one time for similar services. The technologies deployed at **PIONEER ENVIRO** are current and leading edge, duly validated.

PIONEER ENVIRO has an exceptional team of Environment professionals. PIONEER ENVIRO has the expertise to assess the impact of various industrial activities such Power Plants, Steel Plants, Distilleries, Cement Plants etc., on the environment. These assessments will help the industry to install the best Environmental Management Systems and to maintain the plant in accordance with the norms stipulated for ISO-14001 & ISO-18000. **PIONEER ENVIRO** services range from site assessments, environmental audits, environmental impact statements and risk assessments to waste management.

Following are some of the services which are **PIONEER ENVIRO** core competency:

- Helping the client to select the suitable site as per the norms of Ministry of Environment and Forest, Govt. of India and State Pollution Control Boards in India.
- Environmental Impact assessment studies carried out as per the guidelines issued by Ministry of Environment and Forest, Govt. of India and State Pollution Control Boards in India.
- Environment Audits.
- Risk Assessment and Disaster Management Studies.

- Occupational health & industrial hygiene.
- Solid waste management.
- Environmental baseline studies covering the fields of ambient Air, Surface water, Ground water, Soil, Noise and Biological Environment (Flora & Fauna).
- Stack Emission Monitoring, Effluent Analysis, Ground water analysis.
- Design of Effluent Treatment Plant
- Design of Sewage Treatment Plant

The company has applied to QCI-NABET for accreditation for EIA consultants and accordingly QCI-NABET has accorded accreditation to our Consultancy organization for preparation of EIA report to Distillery plant.

ANNEXURES

ANNEXURE -1

F. No. J-11011/579/2010- IA II (I)
Government of India
Ministry of Environment and Forests
(I.A. Division)

Paryavaran Bhawan
CGO Complex, Lodhi Road
New Delhi – 110 003

E-mail : aditya.narayan@nic.in
Telefax : 011: 2436 0549
Dated 16th October, 2012

To,

Shri Ravichandran Gogineni (Director)
M/s Crux Biotech India Pvt. Ltd.
8-3-22/C/1, A-26, Madhuranagar,
Ameerpet Hyderabad
Andhra Pradesh – 500 038

E-mail: Ravichandran@cruxbiotechindia.com; ravi_gog@hotmail.com; pelcpl@gmail.com;
Fax No. : 040 - 66562830

Subject: Grain based Distillery (60 KLPD) Unit and CPP (2.5 MW) at Plot No. 529 part, 530, 531 part, 532 part, 536 part, 557 part, 560 part & 564 part Village Peddavarm, Mandal Nandigama, District Krishna, Andhra Pradesh by M/s Crux Biotech India Pvt. Ltd. – Environmental Clearance reg.

Ref. : Your letter no. nil dated 3rd November, 2011.

Sir,

Kindly refer your letter dated 3rd November, 2011 alongwith project documents including Form I, Terms of References, Pre-feasibility Report, EIA/EMP Report alongwith Public Hearing Report and subsequent submission of additional information vide letter dated 4th February, 2012 regarding above mentioned project.

2.0 The Ministry of Environment and Forests has examined the application. It is noted that proposal is for setting up of Grain based Distillery (60 KLPD) at Plot No. 529 part, 530, 531 part, 532 part, 536 part, 557 part, 560 part & 564 part Village Peddavarm, Mandal Nandigama, District Krishna, Andhra Pradesh. Total plot area is 28.98 acres. Project cost is Rs. 63.71 Crores. Krishna River is flowing at 1.3 Km. No eco-sensitive area such as national park/wildlife sanctuary/biosphere reserve is located within 10 km. Jaggayyapeta RF and Gudimetla RF are located at 1.2 Km and 4.1 Km respectively. Plant will be operated for 330 days per annum.

3.0 . Bag filter alongwith stack of adequate height will be provided to coal/biomass fired boiler to control particulate emission within 50 mg/Nm^3. Total fresh water requirement from ground water source/Krishna River will be 640 m^3/day for distillery and cogeneration unit. Spent wash generation will be 360 m^3/day. Spent wash will be passed through decanter and concentrated in multi-effect evaporator (MEE). Thick syrup and wet cake will be mixed together to form Distiller's Wet Grains with Soluble (DWGS) to achieve zero discharge. Distiller's Wet Grains with Soluble (DWGS) will be dried to form Distiller's Dry Grains with Soluble (DDGS). Spentlees and utilities wastewater will be treated in effluent treatment plant (ETP). No effluent will be discharged outside the factory premises and 'Zero' effluent discharge concept will be implemented. Storage capacity for spent wash lagoon will be 5 days. DDGS will be sold as cattle feed. Fly ash will be sold to the brick manufacturers/cement.

4.0 Public hearing/public consultation meeting was conducted on 27th September, 2011.

5.0 All cane juice/non-molasses based distillery (>30 KLD) are listed at S.N. 5(g) (ii) under category 'A' and appraised at Central level.

6.0 The proposal was considered by the Expert Appraisal Committee (Industry-2) in its 20th and 32nd meetings held during 3rd-4th March, 2011 and 16th–17th February, 2012 respectively. The Committee recommended the proposal for environmental clearance.

7.0 Based on the information submitted by the project proponent, the Ministry of Environment and Forests hereby accords environmental clearance to above project under the provisions of EIA Notification dated 14th September 2006, subject to the compliance of the following Specific and General Conditions:

A. SPECIFIC CONDITIONS:

i) Environment clearance accorded is for grain based distillery unit (60 KLPD) only and no molasses based distillery unit shall be operated without prior permission from the Ministry.

ii) Permission shall be obtained from the State Forest Department regarding the impact of the proposed unit on the surrounding reserve forest viz. Jaggayyapeta RF and Gudimetla RF.

iii) Efforts shall be made to reduce PM_{10} levels in the ambient air and a time bound action plan shall be submitted. Bag filter alongwith stack of adequate height shall be provided to coal/biomass fired boiler to control particulate emission within 50 mg/Nm^3. At no time, the emission levels should go beyond the prescribed standards. In the event of failure of any pollution control system adopted by the unit, the respective unit shall not be restarted until the control measures are rectified to achieve the desired efficiency.

iv) The National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R. No. 826(E) dated 16th November, 2009 shall be followed.

v) In plant, control measures for checking fugitive emissions from all the vulnerable sources shall be provided. Fugitive emissions shall be controlled by providing closed storage, closed handling & conveyance of chemicals/materials, multi-cyclone separator and water sprinkling system. Dust suppression system including water sprinkling system shall be provided at loading and unloading areas to control dust emissions. Fugitive emissions in the work zone environment, product, raw materials storage area etc. shall be regularly monitored and records shall be maintained. The emissions shall conform to the limits imposed by A P Pollution Control Board (APPCB).

vi) Pucca approach road to project site shall be constructed prior to commencing construction activity of the main distillery so as to avoid fugitive emissions.

vii) The gaseous emissions from DG set shall be dispersed through adequate stack height as per CPCB guidelines. Acoustic enclosure shall be provided to the DG sets to mitigate the noise pollution.

viii) The company shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on its website and shall update the same periodically. It shall simultaneously be sent to the Regional office of MOEF, the respective Zonal office of CPCB and the APPCB. The levels of PM_{10}, SO_2, NOx, CO and HC (Methane) in ambient air shall be monitored and displayed at a convenient location near the main gate of the company and at important public places.

ix) Total fresh water requirement from ground water source/ Krishna River shall not exceed 10.6 KL/KL of alcohol (i.e. 640 m^3/day) for distillery for cogeneration unit and prior permission for drawl of water shall be obtained from the concerned authorities. A copy of permission shall be submitted to the Ministry's Regional Office at Bangalore. Explore the possibility for using surface water only.

x) Efforts shall be made to réduce the fresh water requirement from ground water source by adopting 3 R's (Reduce, Reuse and Recycle) concept.

xi) Spent wash generation shall not exceed 6 Kl/Kl of alcohol. Spent wash shall be treated through decanter and concentrated in multi-effect evaporator (MEE) to form DWGS. Spentlees, effluent from utilities and cogeneration unit shall be treated in effluent treatment plant (ETP) and water quality of treated effluent shall meet the norms prescribed by CPCB/SPCB and recycle/reuse.

xii) No effluent from distillery and co-generation power plant shall be discharged outside the factory premises and 'Zero' effluent discharge concept shall be adopted.

xiii) Process effluent/any wastewater shall not be allowed to mix with storm water. Storm water drain shall be passed through guard pond.

xiv) Spent wash shall be stored in impervious lagoon with HDPE lining as per CPCB guidelines and shall be kept in proper condition to prevent ground water pollution. Storage capacity of spent wash lagoon shall be for 5 days.

xv) Adequate numbers of ground water quality monitoring stations by providing piezometers around the project area shall be set up. Sampling and trend analysis monitoring must be made on monthly a basis and report submitted to SPCB and this Ministry. The ground water quality monitoring for pH, BOD, COD, Chloride, Sulphate and Total Dissolve Solids shall be monitored and report submitted to the Ministry's Regional Office at Bangalore and APPCB.

xvi) No storage of wet cake shall be done at site to avoid odour problem. An additional dryer shall be installed so that at any time wet cake is not sold then wet cake shall be converted into dry cake by operating additional dryer.

xvii) Biomass/coal storage shall be done in such a way that it does not get air borne or fly around due to wind. For this, it shall be kept in wet form.

xviii) Boiler ash shall be stored separately as per CPCB guidelines so that it shall not adversely affect the air quality, becoming air borne by wind or water regime during rainy season by flowing alongwith the storm water. Direct exposure of workers to fly ash & dust shall be avoided.

xix) As proposed, ash shall be transferred in the covered truck. Ash shall be transferred to the brick manufacturing. A tie-up with brick manufacturers to be made in the form of agreement.

xx) Fire fighting system shall be as per norms and cover all areas where alcohol is produced, handled and stored. Provision of foam system for fire fighting shall be made to control fire from the alcohol storage tank.

xxi) Risk Assessment shall be carried to assess the fire and explosion risk due to storage of alcohol and report submitted to the Ministry and its Regional Office at Bangalore within six months.

xxii) Occupational health surveillance programme shall be undertaken as regular exercise for all the employees. The first aid facilities in the occupational health centre shall be strengthened and the regular medical test records of each employee shall be maintained separately.

xxiii) Dedicated parking facility for loading and unloading of material shall be provided in the factory premises. Unit shall develop and implement good traffic management system for their incoming and outgoing vehicles to avoid congestion on the public road.

xxiv) As proposed, green belt shall be developed in 9 acres out of total land 29.8 acres and plantation shall be done as per the CPCB guidelines in consultation with DFO. Thick greenbelt with suitable plant species shall be developed around the proposed distillery to mitigate the odour problem.

xxv) All the commitment made regarding issues raised during the public hearing/ consultation meeting held on 27th September, 2011 shall be satisfactorily implemented.

xxvi) Provision shall be made for the housing for the construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile sewage treatment plant, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structure to be removed after the completion of the project. All the construction wastes shall be managed so that there is no impact on the surrounding environment.

B. GENERAL CONDITIONS:

i. The project authorities shall strictly adhere to the stipulations made by the A P Pollution Control Board.

ii. No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment and Forests. In *case* of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.

iii. The locations of ambient air quality monitoring stations shall be decided in consultation with the AP Pollution Control Board (APPCB) and it shall be ensured that at least one station is installed in the upwind and downwind direction as well as where maximum ground level concentrations are anticipated.

iv. The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall conform to the standards prescribed under Environment (Protection) Act, 1986 Rules, 1989 viz. 75 dBA (day time) and 70 dBA (night time).

v. The Company shall harvest rainwater from the roof-tops of the buildings and storm water drains to recharge the ground water and use the same water for the process activities of the project to conserve fresh water.

vi. The Company shall obtain Authorization for collection, storage and disposal of hazardous waste under the Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules, 2008 and its amendment time to time and prior permission from APPCB shall be obtained for disposal of solid / hazardous waste including boiler ash.

vii. During transfer of materials, spillages shall be avoided and garland drains be constructed to avoid mixing of accidental spillages with domestic wastewater and storm water drains.

viii. Usage of Personnel Protection Equipments by all employees/ workers shall be ensured.

ix. Training shall be imparted to all employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be undertaken on regular basis. Training to all employees on handling of chemicals shall be imparted.

x. The company shall also comply with all the environmental protection measures and safeguards proposed in the project report submitted to the Ministry. All the recommendations made in the EIA/EMP in respect of environmental management, risk mitigation measures and public hearing relating to the project shall be implemented.

xi. The company shall undertake CSR activities and all relevant measures for improving the socio-economic conditions of the surrounding area.

xii. The company shall undertake eco-developmental measures including community welfare measures in the project area for the overall improvement of the environment.

xiii. A separate Environmental Management Cell equipped with full fledged laboratory facilities shall be set up to carry out the Environmental Management and Monitoring functions.

xiv. The company shall earmark sufficient funds for capital cost and recurring cost per annum to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management/ pollution control measures shall not be diverted for any other purpose.

xv. A copy of the clearance letter shall be sent by the project proponent to concerned Panchayat, ZilaParisad/Municipal Corporation, Urban local Body and the local NGO, if any, from who suggestions/ representations, if any, were received while processing the proposal.

xvi. The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Environmental Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the A P Pollution Control Board. A copy of Environmental Clearance and six monthly compliance status report shall be posted on the website of the company.

xvii. The environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the A P Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and shall also be sent to the Bangalore Regional Offices of MoEF by e-mail.

xviii. The project proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB/Committee and may also be seen at Website of the Ministry at http://envfor.nic.in. This shall be advertised within seven days from the date of issue of the clearance letter, at least in two local newspapers that are widely circulated in the region of which one shall be in

the vernacular language of the locality concerned and a copy of the same shall be forwarded to the concerned Regional Office of the Ministry.

xix. The project authorities shall inform the Regional Office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of the project.

8.0 The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.

9.0 The Ministry reserves the right to stipulate additional conditions, if found necessary. The company in a time bound manner will implement these conditions.

10.0 The above conditions will be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, Air (Prevention &. Control of Water Pollution) Act, 1981, the Environment (Protection) Act, 1986 Hazardous Wastes (Management and Handling) Rules, 2003/ 2008 and the Public Liability Insurance Act, 1991 along with their amendments and rules.

(A.N. Singh)
Dy. Director (S)

Copy to :-

1. The Principal Secretary, Department of Environment, Forest, Science & Technology, Government of Andhra Pradesh, Hyderabad, A.P.
2. The Chief Conservator of Forests, Regional Office (Southern Zone, Bangalore) Kendriya Sadan, 4th Floor, E&F Wing, II Block Koramangala, Banglore-560034.
3. The Chairman, Central Pollution Control Board Parivesh Bhavan, CBD-cum-Office Complex, East Arjun Nagar, New Delhi - 110 032.
4. The Chairman, Andhra Pradesh Pollution Control Board, Paryavaran Bhawan, A-III, Industrial Estate, Sanath Nagar, Hyderabad - A.P.
5. Adviser, IA II(I), Ministry of Environment and Forests, Paryavaran Bhavan, *CGO* Complex, New Delhi.
6. Monitoring Cell, Ministry of Environment and Forests, Paryavaran Bhavan, *CGO* Complex, New Delhi.
7. Guard File/Monitoring File/Record File.

(A.N. Singh)
Dy. Director (S)

ANNEXURE - 1

भारत सरकार
GOVERNMENT OF INDIA
पर्यावरण ,वन एवं जलवायु परिवर्तन मंत्रालय
MINISTRY OF ENVIRONMENT, FORESTS & CLIMATE CHANGE
Regional Office (South Eastern Zone),
1st & 2nd floor, HEPC Building, No.34, Cathedral Garden Road,
Nungambakkam, Chennai - 600034

F.No. EP/12.1/2012-13/39/AP /0887
08.06.2017

To,

Shri. Ravichandran Gogineni,
Managing Director
M/s. Crux Biotech India Private Limited
R. Sy No:529,530,531,532,
Peddavaram Village, Nandigama Mandal,
Krishna District,
Andhra Pradesh-521185.

Subject: Grain based Distillery Plant (60 KLPD) along with Captive Power Plant (2.5 MW) a Plot No. 529 (p), 530, 531(p), 532(p), 536(p), 557(p), 564(p), Village Peddavaram, Mandal Nandigama, District Krishna, Andhra Pradesh by M/s. Crux Biotech India Pvt. Ltd- Environmental Clearance-Reg.-Certified Copy of the Compliance Report-Reg.

Reference: 1) F.No. J-11011/579/2010-IA II (I) dated 16.10.2012.
2) Your letter dated 20.03.2017.

Sir/Madam,

With reference to 2nd cited above, please find enclosed herewith a certified copy of the compliance report. This has been approved by the Addl.PCCF(C) vide diary no.637 dt 23.05.2017.

Yours faithfully,

(Dr.C.Kaliyaperumal)
Director (S)

Dr. C. KALIYAPERUMAL, M.E., PhD
Director (S)
Government of India
Ministry of Environment, Forests & Climate Change
Regional Office (South Eastern Zone)
HEPC Building, No.34, Cathedral Garden Road,
Nungambakkam, Chennai-600 034.

Encl: As above.

Certified Copy of the Compliance Report

Subject: Grain based Distillery Plant (60 KLPD) along with Captive Power Plant (2.5 MW) a Plot No. 529 (p), 530, 531(p), 532(p), 536(p), 557(p), 564(p), Village Peddavaram, Mandal Nandigama, District Krishna, Andhra Pradesh by M/s. Crux Biotech India Pvt. Ltd-Environmental Clearance-Reg.

Reference: F.No. J-11011/579/2010-IA II (I) dated 16.10.2012.

Present Status of the project:

The Project Authority (PA) have constructed and commissioned the project and they are producing 60 KL of ENA per day. The unit is under operation.

Date of Monitoring: 20.05.2017.

A. SPECIFIC CONDITIONS:

S.No	Conditions	Compliance
i)	Environment clearance accorded is for grain based distillery unit (60 KLPD) only and no molasses based distillery unit shall be operated without prior permission from the Ministry.	Complied. Environmental clearance accorded is for grain based distillery unit (60 KLPD) only and not molasses based distillery unit and the Project Authorities (PA) is manufacturing grain based ENA only. They have agreed to obtain permission from the Ministry in case they change the raw material. The PA have obtained consent to operate from APPC vide letter No. APPCB/VJA/VJA/HO/2016 dated 25-02-2016 under water Act & Air Act for grain based operation only. Consent to operate for grain based production is enclosed as Annexure-1.
ii)	Permission shall be obtained from the State Forest Department regarding the impact of the proposed unit on the surrounding reserve forest viz. Jaggayyapeta RF and Gudimetla RF.	Complied. The PA have obtained permission from State Forest Department vide their letter number Rc.No./1795/2011-F3. dated 15-04-2011 from the Office of the Principal Chief Conservator of Forests, AP.Copy is enclosed as Annexure-2.
iii)	Measures shall be taken to mitigate PM_{10} levels in the ambient air and a time bound action plan shall be submitted. Bag filter along with stack of adequate height shall be provided to coal / biomass fired boiler to control particulate emission within 50 mg/NM^3. At no time, the emission levels	Complied. An adequate measures such as pucca cement concrete roads in the factory areas, water sprinkling and regular cleaning are carried out to mitigate the dust levels to reduce PM_{10} level in the ambient air. They have installed Bag

	should go beyond the prescribed standards. In the event of failure of any pollution control system adopted by the unit, the respective unit shall not be restarted until the control measures are rectified to achieve the desired efficiency.	filters to minimise particulate emissions. 45 meters height and 1.4 meter dia stack is provided. The boiler emission level is within 50 mg/NM^3. As informed the levels did not go beyond the limits and they get alarm in case of exceeding the limit. Further the PA have informed that in the event of failure of any pollution control system adopted by the unit, the respective unit will not be restarted until the control measures are rectified to achieve the desired efficiency. Bag filters & Stack photographs are enclosed Stack results as Annexure-3.
iv)	The National Ambient Air Quality Emission Standards issued by the Ministry vide G.S.R. No.826 (E) dated 16th November, 2009 shall be followed.	Complied. The PA have purchased one High Volume Sampler and monitoring the ambient air quality on monthly basis in consultation with SPCB. Though the levels are within the limit, the frequency of monitoring is inadequate. The undersigned directed the PA to increase the monitoring frequency and for that they have agreed. Reports are enclosed as Annexure-4.
v)	In plant, control measures for checking fugitive emissions from all the vulnerable sources shall be provided. Fugitive emissions shall be controlled by providing closed storage, closed handling & conveyance of chemicals/materials, multi-cyclone separator and water sprinkling system. Dust suppression system including water sprinkling system shall be provided at loading and unloading areas to control dust emissions. Fugitive emissions in the work zone environment, product, raw materials storage area etc. shall be regularly monitored and records shall be maintained. The emissions shall conform to the limits imposed by A P Pollution Control Board (APPCB).	Complied. In plant control measures such as internal concrete roads, regular manual cleaning of dusts, water sprinkling, covered transportation and fully covered storage sheds are carried out to control the fugitive dust levels. In the work zone environment, product and raw materials storage area etc., fugitive emission levels are regularly monitored and records are maintained. The emissions levels are conforming to the limits imposed by AP Pollution Control Board (APPCB). On line stack emission monitoring equipment is installed to the boiler stack and the real time monitored data are transmitted to CPCB and SPCB's server.
vi)	Pucca approach road to project site shall be constructed prior to commencing construction activity of the main distillery so as to avoid fugitive emissions.	Complied. The PA have widened the approach road to project site and have also laid pucca road before commencing the construction activity of main distillery to avoid fugitive emissions.

		Photographs are enclosed as Annexure-5.
vii)	The gaseous emissions from DG set shall be dispersed through adequate stack height as per CPCB guidelines. Acoustic enclosure shall be provided to the DG sets to mitigate the noise pollution.	Complied. DG Set has been provided with acoustic enclosure and an appropriate height of stack as per CPCB guidelines.
viii)	The company shall upload the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on its website and shall update the same periodically. It shall simultaneously be sent to the Regional Office of MOEF, the respective Zonal office of CPCB and the APPCB. The levels of PM_{10}, SO_2, NOx, CO and HC (Methane) in ambient air shall be monitored and displayed at a convenient location near the main gate of the company and at important public places.	Complied. The PA have uploaded the status of compliance of the stipulated environmental clearance conditions, including results of monitored data on their website. They have submitted the same to MoEF, RO, the respective Zonal office of CPCB and the APPCB. The levels of PM_{10}, SO_2, NOx, CO (except HC–Methane) in ambient air are monitored and displayed at a convenient location near the main gate of the company .The company has installed online stack monitoring system and real time data are connected to CPCB and SPCB's server.
ix)	Total fresh water requirement from ground water source/Krishna River shall not exceed 10.60KL/KL of alcohol (i.e. 640 m^3/day) for distillery and cogeneration unit (2.5 MW) and prior permission for drawl of water shall be obtained from the concerned authorities. A copy of permission shall be submitted to the Ministry's Regional office at Bangalore. Explore the possibility of using surface water only.	Complied. Total fresh water requirement has not exceed 10.6KL/KL of alcohol (i.e. 640m^3/day) for distillery and cogeneration unit (2.5 MW) as informed. They are drawing water from the river Krishna and for that the PA have obtained permission from the Irrigation department, Govt. of A.P. Copy of the order for ground water drawl is enclosed as Annexure-6. Permission letter for drawl of water from river Krishna is enclosed as Annexure-7.
x)	Efforts shall be made to reduce the fresh water requirement from ground water source by adopting 3R's (Reduce, Reuse and Recycle) concept.	Complied. The PA are reusing the treated effluent for cooling water make up and green belt development. They are in the process of following the 3R's.
xi)	Spent wash generation shall not exceed 6 KL/KL of alcohol. Spent wash shall be treated through decanter and concentrated in multi-effect evaporator (MEE) followed by dryer to form DDGS. Spent less effluent from bottle washing, utilities and cogeneration unit shall be treated in effluent treatment plant (ETP) and water	Complied. The spent wash generated is within specified limit of 6 KL/KL of alcohol and treated in the Effluent treatment plant through decanters and it is fed into Multiple Effect Evaporator (MEE) followed by Dryer to produce DDGS. The effluent is monitored by the PA

	quality of treated effluent shall meet the norms prescribed by CPCB/SPCB and recycle/reuse.	and the levels are within the limit of APPCB. The PA have also installed on line effluent monitoring equipment for pH, TSS, BOD and COD and real time data are connected to CPCB and APPCB's servers.
xii)	No effluent from distillery and co-generation power plant shall be discharged outside the factory premises and 'Zero' effluent discharge concept shall be adopted.	Complied. No effluent from distillery and co-generation power plant is discharged outside the factory premises and they are following 'Zero' Liquid Discharge (ZLD) concept.
xiii)	Process effluent/any waste water shall not be allowed to mix with storm water. Storm water drain shall be passed through guard pond.	Complied. The PA have provided separate concrete drains for storm water collection. The process waste water and the storm water are not mixed.
xiv)	Spent wash shall be stored in impervious lagoon with HDPE lining as per CPCB guidelines and shall be kept in proper condition to prevent ground water pollution. Storage capacity of spent wash lagoon shall be for 5 days.	Complied. The PA informed that lagoons are not required as the plant is operating on grain based only. The spent wash generated is directly fed into decanters and then to Multiple Effect Evaporator (MEE) followed by dryer to produce Distillery Wet Grain Soluble (DWGS). The PA have informed that the factory operations would be stopped immediately if at all any disturbances occurs and also have agreed to make an emergency storage pond/lagoon.
xv)	Adequate numbers of ground water quality monitoring stations by providing piezometers around the project area shall be set up. Sampling and trend analysis monitoring must be made on monthly basis and report submitted to SPCB and this Ministry. The ground water quality monitoring for pH, BOD, COD, Chloride, Sulphate and Total Dissolve Solids shall be monitored and report submitted to the Ministry's Regional Office at Bangalore and APPCB.	Refer below. The PA monitoring the ground water quality in one location through private party on monthly basis. Results are attached as Annexure-9. The undersigned directed the PA monitor the ground water levels by using piezometer around the project sites and for that the PA have agreed. The monitored data was submitted to MoEF, RO along with compliance report and also to APPCB.
xvi)	No storage of wet cake shall be done at site to avoid odour problem. An additional dryer shall be installed so that at any time wet cake is not sold then wet cake shall be converted into dry cake by operating additional dryer.	Complied. The PA is having wet cake and well as dry cake collecting system. Now they are collecting wet cake and disposing to private parties to use as poultry feed.
xvii)	Biomass/coal storage shall be done in such a way that it does not get air borne or fly	Complied. The PA have made has been a covered

	around due to wind. For this, it shall be kept in wet form.	storage sheds for storing coal.
xviii)	Boiler ash shall be stored separately as per CPCB guidelines so that it shall not adversely affect the air quality, becoming air borne by wind or water regime during rainy season by flowing along with the storm water. Direct exposure of workers to fly ash & dust shall be avoided.	Complied. Complete closed ash handling system is provided to avoid ash in to air and total generated ash is sold to brick manufacturers. Direct exposure of dust is avoided since the ash is collected in the vehicle directly from the ash silo.
xix)	As proposed, ash shall be transferred in the covered truck. Ash shall be transferred to the brick manufacturing. A tie-up with brick manufacturers to be made in the form of agreement.	Complied. The PA have made a tie-up with brick manufactures, who regularly lift the ash in covered trucks to their location. Tie up letter attached as Annexure-8.
xx)	Fire fighting system shall be as per norms and cover all areas where alcohol is produced, handled and stored. Provision of foam system for fire fighting shall be made to control fire from the alcohol storage tank.	Complied. The PA have installed fire fighting system in all areas where alcohol is produced, handled and stored. Foam system and auto sprinklers are also has been provided to control fire.
xxi)	Risk Assessment shall be carried to assess the fire and explosion risk due to storage of alcohol and report submitted to the Ministry and its Regional Office at Bangalore within six months.	Refer below. Though the PA informed that Risk Assessment study was carried out to assess the fire and explosion risk due to storage of alcohol and the report was submitted to MoEF, RO no details made available.
xxii)	Occupational health surveillance programme shall be undertaken as regular exercise for all the employees. The first aid facilities in the occupational health centre shall be strengthened and the regular medical test records of each employee shall be maintained separately.	Complied. Occupational health surveillance programme is carried out for all the employees. The company has set up a Dispensary in the factory premises and appointed a full time Medical Assistant to carry out regular medical tests for the employees.
xxiii)	Dedicated parking facility for loading and unloading of material shall be provided in the factory premises. Unit shall develop and implement good traffic management system for their incoming and outgoing vehicles to avoid congestion on the public road.	Complied. Dedicated vehicle parking facility for loading and unloading of material are provided in the factory premises. The PA informed that the drivers are instructed to follow the good traffic management system for their incoming and outgoing vehicles to avoid congestion on the public road.
xxiv)	As proposed, green belt shall be developed in 9 acres out to total land 29.8 acres and plantation shall be done as per the CPCB guidelines in consultation with DFO. Thick greenbelt with suitable plant species shall be developed around the proposed	Complied. The PA have taken up plantation along the compound wall, outside the factory of their own land and within the factory by planting different plantation. They have covered more than 9 ac. The

	distillery to mitigate the odour problem.	plantation works and survival rates are good. Photographs enclosed as Annexure-3.
xxv)	All the commitments made during the Public Hearing / Public consultation meeting held on 27th September 2011 shall be satisfactorily implemented and adequate budget provision should be made accordingly.	Complied. As informed by the PA Public hearing commitments are: Local employment, Pollution free environment, provision for Green belt, Maintaining ZLD. All the commitments made during Public Hearing are being implemented by providing local employment for 120 people, by providing 9 acres greenbelt and maintaining plant with Zero liquid Discharge.
xxvi)	Provision shall be made for the housing for the construction labour within the site with all necessary infrastructure and facilities such as fuel for cooking, mobile toilets, mobile sewage treatment plant, safe drinking water, medical health care, crèche etc. The housing may be in the form of temporary structure to be removed after the completion of the project. All the construction wastes shall be managed so that there is no impact on the surrounding environment.	Complied. The PA informed that necessary provision such as fuel for cooking, toilets, safe drinking water, medical health care were provided to the construction labours during the construction time . The housing were in temporary in nature and were removed after the construction works are completed. They have utilized the construction waste within the factory itself for levelling purpose.

B. GENERAL CONDITIONS:

S.No	Conditions	Compliance
i)	The Project authorities shall strictly adhere to the stipulations made by the AP Pollution Control Board.	Complied. The PA informed that all the stipulations made by the PCB are being implemented regularly. The CFO is valid up to 31.3.2021.
ii)	No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment and Forests. In case of deviations or alterations in the project proposal from those submitted to this Ministry for clearance, a fresh reference shall be made to the Ministry to assess the adequacy of conditions imposed and to add additional environmental protection measures required, if any.	Complied. No further expansion or modifications were carried out without prior approval of the Ministry of Environment and Forests. Now they are going for an expansion from 60 KLPD to 75 KLPD.
iii)	The locations of ambient air quality monitoring stations shall be decided in consultation with the A P Pollution Control Board (APPCB) and it shall be	Refer below. The PA informed that Ambient Air Quality is Monitored at three locations in consultation with PCB officials on

	ensured that at least one station is installed in the upwind and downwind direction as well as where maximum ground level concentrations are anticipated.	monthly basis covering upwind and downwind direction as well as where maximum ground level concentrations are anticipated. Though the levels are within the limits, frequency of monitoring is inadequate. The undersigned directed to increase the frequency and for that they have agreed.
iv)	The overall noise levels in and around the plant area shall be kept well within the standards by providing noise control measures including acoustic hoods, silencers, enclosures etc. on all sources of noise generation. The ambient noise levels shall conform to the standards prescribed under Environment (Protection) Act, 1986 Rules, 1989 viz. 75 dBA (day time) and 70 dBA (night time).	Complied. Following measures are being adopted to control the noise levels: 1) Acoustic enclosure for turbine & DG set are provided. 2) Green belt development (Plantation of dense tress across the boundary and in plant premises) is carried out. 3) Earmuffs are provided to all the employees and are using 4) Noise levels are monitored at five locations during day and night time through external agency and the levels are within the limits. Enclosed as Annexure-10.
v)	The Company shall harvest rainwater from the roof-tops of the buildings and storm water drains to recharge the ground water and use the same water for the process activities of the project to conserve fresh water.	Complied. The PA have developed rain water harvesting arrangement including for the roof top collection and storm water drain.
vi)	The Company shall obtain Authorization for collection, storage and disposal of hazardous waste under the Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules, 2008 and its amendment time to time and prior permission from APPCB shall be obtained for disposal of solid / hazardous waste including boiler ash.	Complied. The PA have obtained Authorization for handling hazardous waste and it is valid up to 31.3.2021.
vii)	During transfer of materials, spillages shall be avoided and garland drains be constructed to avoid mixing of accidental spillages with domestic wastewater and storm water drains.	Complied. During transfer of materials, spillages are avoided. Separate drains are made to avoid mixing of accidental spillages with domestic water and storm water.
viii)	Usage of Personnel Protection Equipments by all employees / workers shall be ensured.	Complied. Personnel protective Equipments like face shield, Helmets, Rubber Gumboot, Goggles are provided to all employees and are using.
ix)	Training shall be imparted to all	Complied

	employees on safety and health aspects of chemicals handling. Pre-employment and routine periodical medical examinations for all employees shall be undertaken on regular basis. Training to all employees on handling of chemicals shall be imparted.	As informed by the PA all the employees and workers are provided training on safety and health aspects. Handling instructions and safety precautions are displayed at all visible locations. Pre-Medical tests as well as regular medical check up for all the employees are carried out.
x)	The company shall also comply with all the environmental protection measures and safeguards proposed in the project report submitted to the Ministry. All the recommendations made in the EIA/EMP in respect of environmental management, risk mitigation measures and public hearing relating to the project shall be implemented.	Complied The PA have implemented all the recommendations made in the EIA/EMP.
xi)	The company shall undertake CSR activities and all relevant measures for improving the socio-economic conditions of the surrounding area.	Complied. The PA informed that the following CSR activities for the development of Socio economic condition of the area has been carried out. 1. Company has given an employment to local people (120 Members in different grades). 2. Rs 2.4 lakh worth donations have been given to the nearby religious holy mandirs. 3. An arrangement of free medical camp in nearby village of Peddavaram was carried out. 4. Provided Lap tops to the village students.
xii)	The company shall undertake eco-developmental measures including community welfare measures in the project area for the overall improvement of the environment.	Complied. As gathered that the PA have organised massive plantation programme in 2015 and in 2016 at Peddavaram Village and planted total of 2300 number of saplings on both sides of village road and factory approach road. The PA have desilted half acre village pond for the usage of villagers and also for the benefit of animals and birds during the summer period.
xiii)	A separate Environmental Management Cell equipped with full-fledged laboratory facilities shall be set up to carry out the Environmental Management and Monitoring functions.	Complied. The PA have set up an Environment Management Cell equipped with a full-fledged laboratory in their factory premise. The PA monitoring AAQ, stack emissions and effluent quality in

		addition to external laboratory.
xiv)	The company shall earmark sufficient funds for capital cost and recurring cost per annum to implement the conditions stipulated by the Ministry of Environment and Forests as well as the State Government along with the implementation schedule for all the conditions stipulated herein. The funds so earmarked for environment management / pollution control measures shall not be diverted for any other purpose.	Complied. The PA have earmarked an amount of Rs.17 Crore to implement the conditions stipulated by the Ministry of Environment and to maintain the environment management and pollution control measures. As informed by the PA they have spent nearly Rs.18.5 Crore as capital cost for following environment management / pollution control measures. 1) Construction of ETP and Equipments 2) Construction of MEE section and Equipment 3) Construction of Dryer section and equipment 4) Bag Filter and Stack 5) Ash Handling 6) And Recurring cost of Rs.98.89 lakhs has been spent.
xv)	A copy of the clearance letter shall be sent by the project proponent to concerned Panchayat, Zila Parisad/Municipal Corporation, Urban local Body and the local NGO, if any, from who suggestions / representations, if any, were received while processing the proposal.	Complied. The PA informed that a copy of EC was sent to the concerned authorities.
xvi)	The project proponent shall also submit six monthly reports on the status of compliance of the stipulated Environmental Clearance conditions including results of monitored data (both in hard copies as well as by e-mail) to the respective Regional Office of MoEF, the respective Zonal Office of CPCB and the A P Pollution Control Board. A copy of Environmental Clearance and six monthly compliance status report shall be posted on the website of the company.	Complied. The PA informed that six monthly compliance report(only hard copy not by e-mail) was submitted to the MoEF, RO, CPCB and APPCB. The PA have agreed to submit both copies in future. A copy of Environmental Clearance and six monthly compliance status report are posted on the website of the company as informed.
xvii)	The environmental statement for each financial year ending 31st March in Form-V as is mandated shall be submitted to the A P Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently, shall also be put on the website of the company along with the status of compliance of environmental clearance conditions and	Refer below. Though the PA informed that Form-V was submitted to APPCB, no details were provided during the visit including uploading the Form-V on their company's website.

	shall also be sent to the Bangalore Regional Offices of MoEF by e-mail.	
xviii)	The project proponent shall inform the public that the project has been accorded environmental clearance by the Ministry and copies of the clearance letter are available with the SPCB/Committee and may also be seen at Website of the Ministry at http://envfor.nic.in. This shall be advertised within seven days from the date of issue of the clearance letter, atleast in two local newspapers that are widely circulated in the region of which one shall be in the vernacular language of the locality concerned and a copy of the same shall be forwarded to the concerned Regional Office of the Ministry.	Complied. The PA had given an advertisement in two local newspapers and submitted copies of the same to RO. Copy enclosed as Annexure-11.
xix)	The project authorities shall inform the Regional office as well as the Ministry, the date of financial closure and final approval of the project by the concerned authorities and the date of start of the project.	Complied. The date of start of project work was informed to the RO.

This has the approval of the Addl.PCCF(C) vide diary no.637 dated 23.05.2017.

(Dr.C.Kaliyaperumal)
Director(S)

Dr. C. KALIYAPERUMAL, M.E., PhD
Director (S)
Government of India
Ministry of Environment, Forests & Climate Change
Regional Office (South Eastern Zone)
HEPC Building, No.34, Cathedral Garden Road,
Nungambakkam, Chennai-600 034.

ANNEXURE -2

SPECIFICATIONS:

FOUNDATION / PLINTH	CRS MASONARY IN C.M.
FOOTING	R.C.C
COLOMNS & ROOFING	R.C.C. 1 : 2: 4
STAIRS	R.C.C. 1 : 2 : 4
SUPER STURUTURE	BRICK MASONARY
INDUSTRIES FLOORING	INDUSTRIAL FLOORING
PLASTERING	CEMENT MORTAR
DOORS & WINDOWS	M.S

DOOR & WINDOWS

DOORS: D: 1.20M x 2.10M
D1: 1.00x 2.10M

WINDOWS: W: 1.20M x 1.50M

ROLLING SHUTTER:
R/S: 3.00M x 3.00M

REFERENCE:

AREAS

IN SY .NO: 529 (PART), 530, 531 (PART), 532 (PART), 536 (PART), 557 (PART), 560 (PART), 564 (PART)

of PEDDAVARAM(V), NANDIGAMA(M), KRISHNA(D), A.P.STATE.,

M/S .CRUX BIOTECH INDIA PRIVATE LIMITED

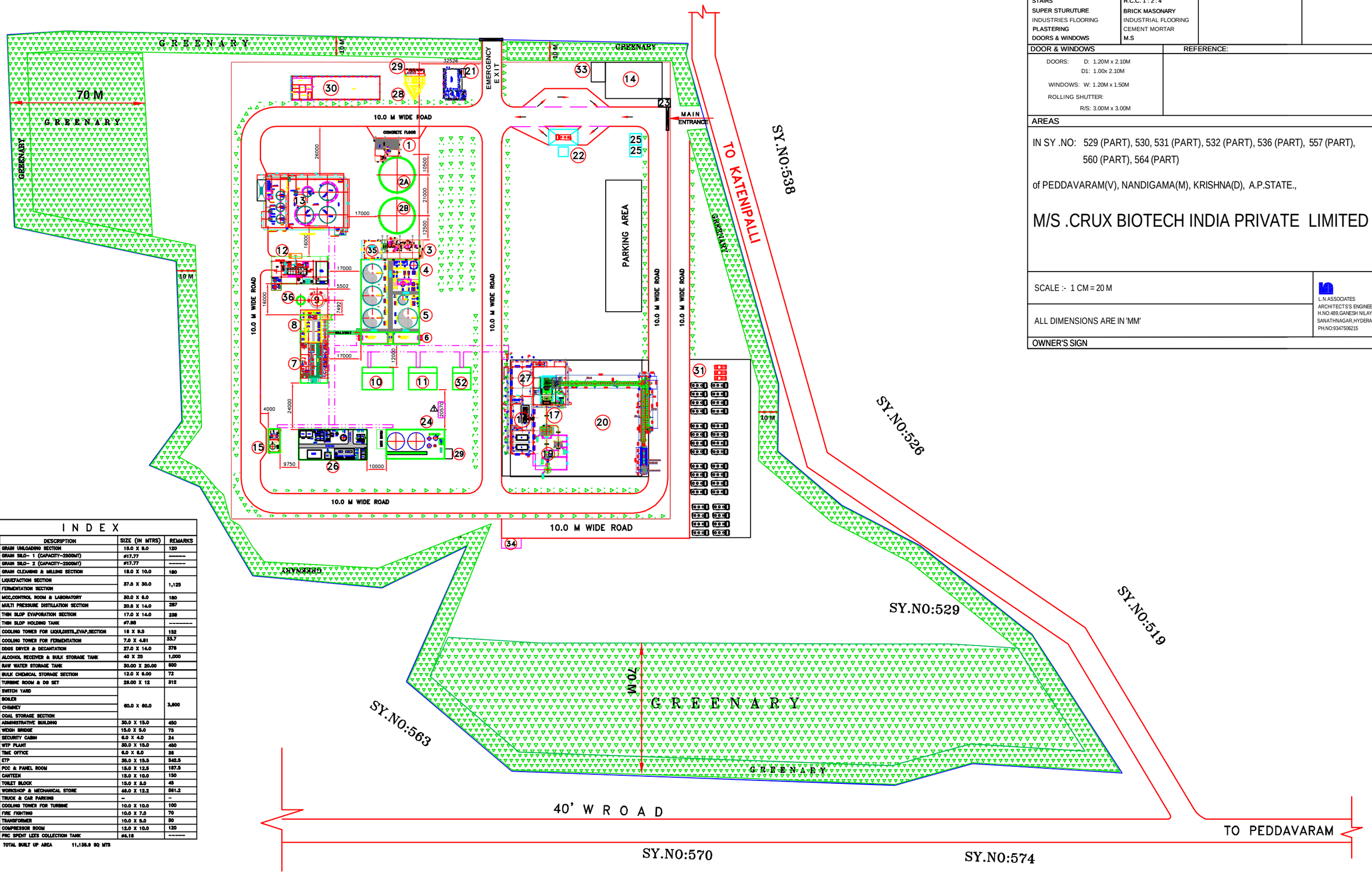
SCALE :- 1 CM = 20 M

ALL DIMENSIONS ARE IN 'MM'

L.N.ASSOCIATES
ARCHITECTS'S ENGINEER'S
H.NO:489,GANESH NILAYAM
SANATHNAGAR,HYDERABAD-18
PH.NO:9347506215

OWNER'S SIGN

N



INDEX

SR.NO.	DESCRIPTION	SIZE (IN MTRS)	REMARKS
1	GRAIN UNLOADING SECTION	15.0 X 8.0	120
2A	GRAIN SILO- 1 (CAPACITY-2500MT)	ø17.77	--------
2B	GRAIN SILO- 2 (CAPACITY-2500MT)	ø17.77	--------
3	GRAIN CLEANING & MILLING SECTION	18.0 X 10.0	180
4	LIQUIFACTION SECTION	37.5 X 30.0	1,125
5	FERMENTATION SECTION		
6	MCC,CONTROL ROOM & LABORATORY	30.0 X 8.0	180
7	MULTI PRESSURE DISTILLATION SECTION	20.5 X 14.0	287
8	THIN SLOP EVAPORATION SECTION	17.0 X 14.0	238
9	THIN SLOP HOLDING TANK	ø7.98	----------
10	COOLING TOWER FOR LIQUIDISTIL,EVAP,SECTION	18 X 9.5	152
11	COOLING TOWER FOR FERMENTATION	7.0 X 4.81	33.7
12	DDGS DRYER & DECANTATION	27.0 X 14.0	378
13	ALCOHOL RECEIVER & BULK STORAGE TANK	40 X 25	1,000
14	RAW WATER STORAGE TANK	30.00 X 20.00	600
15	BULK CHEMICAL STORAGE SECTION	12.0 X 6.00	72
16	TURBINE ROOM & DG SET	26.00 X 12	312
17	SWITCH YARD	60.0 X 60.0	3,600
18	BOILER		
19	CHIMNEY		
20	COAL STORAGE SECTION		
21	ADMINISTRATIVE BUILDING	30.0 X 15.0	450
22	WEIGH BRIDGE	15.0 X 5.0	75
23	SECURITY CABIN	6.0 X 4.0	24
24	WTP PLANT	30.0 X 15.0	450
25	TIME OFFICE	6.0 X 6.0	36
26	ETP	35.0 X 15.5	542.5
27	PCC & PANEL ROOM	15.0 X 12.5	187.5
28	CANTEEN	15.0 X 10.0	150
29	TOILET BLOCK	15.0 X 3.0	45
30	WORKSHOP & MECHANICAL STORE	46.0 X 12.2	561.2
31	TRUCK & CAR PARKING	--	--
32	COOLING TOWER FOR TURBINE	10.0 X 10.0	100
33	FIRE FIGHTING	10.0 X 7.0	70
34	TRANSFORMER	10.0 X 5.0	50
35	COMPRESSOR ROOM	12.0 X 10.0	120
36	PRC SPENT LEES COLLECTION TANK	ø4.16	-------

TOTAL BUILT UP AREA 11,138.8 SQ MTS

Quality Council of India

National Accreditation Board for Education & Training

CERTIFICATE OF ACCREDITATION

This is to certify that

M/s Pioneer Enviro Laboratories & Consultants Pvt. Ltd., Hyderabad

is hereby accorded accreditation under the QCI-NABET Scheme for Accreditation of EIA Consultant Organizations (Version 3)

Scope of Accreditation:

Sl.No.	Name of the Sector	Cat.
1	Mining of minerals including opencast only	A
2	River Valley projects	A
3	Thermal power plants	A
4	Coal washeries	A
5	Mineral beneficiation	B
6	Metallurgical industries (ferrous & non ferrous)	A
7	Cement plants	A
8	Chlor-alkali industry	A
9	Chemical fertilizers	B
10	Synthetic organic chemicals industry (dyes & dye intermediates; bulk drugs and intermediates excluding drug formulations; synthetic rubbers; basic organic chemicals, other synthetic organic chemicals and chemical intermediates)	A
11	Distilleries	A
12	Sugar Industry	B
13	Industrial estates/ parks/ complexes/areas, export processing Zones(EPZs), Special Economic Zones(SEZs), Biotech Parks, Leather Complexes	A
14	Common Municipal Solid Waste Management Facility (CMSWMF)	B
15	Building and construction projects	B
16	Townships and Area development projects	B

Name of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes published on website dated July 12, 2016.

Accreditation to the above is subject to the EIA reports being prepared by the experts (EIA Coordinators and Functional area Expert) mentioned in the above minutes and compliance to the Terms and Conditions of Accreditation.

Certificate No: NABET/ EIA/1619/ RA 026

Valid Up to: June 22, 2019
(Subject to continual compliance to NABET scheme)

C.E.O
NABET

ANNEXURE -4

GOVERNMENT OF ANDHRA PRADESH
GROUND WATER DEPARTMENT

FROM :
Sri A. Varaprasada Rao, M.Sc.M.Sc.(Tech.)
Deputy Director,
Ground Water Department,
Canal Road, Mallikarjunapet,
VIJAYAWADA.

TO:
M/s. Crux Biotech India Pvt. Ltd.,
D.No.8-3-222/C
Street name: A-26, Maduranagar,
Ameerpet,
HYDERABAD.

Lr.No. 421/Hg/SW/2011-12/

Dated:06.09.2011.

Sir,

Sub: Ground Water Department, Vijayawada – Single Window Clearance— Conducting of Ground Water investigations for M/s. Crux Bio-Tech India (PVt.) Limited, Peddavaram village, Nandigama mandal, Krishna district— Furnishing of Report—Reg.

Ref: 1. Director, GWD, Hyderabad Memo No.3651/Hg.II/2010, dt.30.8.11.

--:o:--

With reference to the memo cited, I am herewith furnishing a "REPORT ON GROUND WATER INVESTIGATIONS CARRIEDOUT TO FINDOUT THE FEASIBLITY FOR CONSTRUCTION OF BORE WELLS ON THE PREMISES OF M/S. CRUX BIO-TECH INDIA (PVT.) LIMITED, PEDDAVARAM VILLAGE, NANDIGAMA MANDAL, KRISHNA DISTRICT UNDER SINGLE WINDOW CLEARANCE" for information.

Further, it is to inform that 250 kilo liters of ground water per day is permitted to draw from the recommended 4 dug wells at V1,V2,V3 and V4 as shown in the map by following the terms and conditions as laid down in the report. The confirmation of terms and conditions should be intimated to this office within a period of one month from the date of receipt of the report for onward submission to the Government.

Yours faithfully,

Encls: Report-1

DEPUTY DIRECTOR 6/9/11

Copy submitted to the Director, Ground Water Department, Hyderabad for favour of information.

/Chary/

REPORT ON GROUND WATER INVESTIGATIONS CARRIEDOUT TO FINDOUT THE FEASIBLITY FOR CONSTRUCTION OF BORE WELLS IN THE PREMISES OF M/S. CRUX BIO-TECH INDIA (PVT.) LIMITED, PEDDAVARAM VILLAGE, NANDIGAMA MANDAL, KRISHNA DISTRICT UNDER SINGLE WINDOW CLEARANCE.

INTRODUCTION :

At the request of the Deputy Director, Ground Water Department, Vijayawada and by the order of the Director, Ground Water Department, Hyderabad vide Lr.No.3651/HgII/2011, dated.13.04.2011, integrated Ground Water investigations were conducted in the premises of M/s. Crux Bio-tech India (Pvt.) Limited, Peddavaram village, Nandigama mandal of Krishna District.

The prime objective of the surveys is to choose the best feasible sites for construction of bore wells in the premises and to study the drawl permission of Ground water sources to the above said industrial plant. The surveys were taken up by Sri G.Satyajeevan Rao, Assistant Hydrogeologist and Sri P.Vidya Sagar, Assistant Geophysicists under the able guidance of the Deputy Director of the Department during 23rd June 2011 to 24th June, 2011. The M/s. Crux Bio-tech India (Pvt.) Limited have proposed to establish a distillery plant which will be run with either Ground water or Surface water sources. The requirement of the water for unit is 800 Kl/day as stated in their common application form.

LOCATION & EXTENT:

The investigated area proposed for distillery plant is situated at about 2.5 km Westwards of the village. And it lies in the RS.Nos. of 530, 531, and at parts of 529, 532, 536, 557, 560, 564 etc., of Peddavaram village. The area is falling in the toposheet of 65 D/1 of survey of India. The total extent of the unit area is about 117278 Sq.m. as mentioned in their application.

TOPOGRAPHY:

Basically, the investigated area is enveloped by hill ranges and the gradient is gently westwards. The hill ranges are trending North-South direction.

CLIMATE & RAINFALL:

The climatic conditions of the area is semi arid with hot summers and cold winters. The precipitation of the area receives maximum from South West monsoon and the rest of from North-East monsoon. Generally, the monsoon sets in June and the mercury levels shoot up in the months of April & May. The actual rainfall of the area is registered 1651.2 mm (Nandigama raingauge) as against the normal rainfall of 961.4 mm.

SOILS & DRAINAGE:

The proposed area under investigation is covered with red soils and red loams. The thickness of the soil is varying from 0 to 2.5 m. The drainage pattern is sub dendritic to dendritic in general and density of drainage is fine to medium. Earlier the streams are running towards west and finally merge into river. Most of the streams directions have been changed and disappeared at present.

GEOMORPHOLOGY & GEOLOGY:

The area of investigation is an intermontane valley because it is encircled by the hillocks. The major river Krishna is running on west side at about 2.00 km from the proposed area. Geologically, the area is underlain by granite gneisses of Archaean system. Blanket of the sheet rock is occupied at some places and also out crops are present. The basic intrusives are trending towards North West – South East direction across the strike direction of the rock formation. It acts as Ground water barriers.

HYDROGEOLOGY:

As a whole, Ground water occurs under water table conditions and its occurrence and movement is governed by the porosity and permeability of the rock formation. The degree of weathered and fractured zones plays a vital role to obtain more yields. The dug wells around the investigated area were constructed to a depth of 5 to 7 m.bgl., and its depth to water levels vary from 2.5 to 3.00 m.bgl. at the time of investigations.

During the investigations it is observed that 5 bore wells are existing in the area which was drilled down to a depth of 45 to 75 m.bgl. It is recorded low yields because of the structural controls. Out of 5 bore wells, one bore well casing pipe has been retrieved. The area under investigation is fit for construction of open wells as per the results of the integrated surveys and it is influenced by the local streams.

In order to understand the quality of Ground water two water samples were collected in surrounding areas. Quality of Ground water is suitable for irrigation, industrial and domestic purpose.

GEOPHYSICAL SURVEYS:

To understand the geo-electrical basement 9 VES were conducted with AB/2 = 100 m. using schlumberger method at 9 different locations covering the entire area. The data was interpreted and tabulated below.

VES No	P1	h1	P2	h2	P3	h3	H
1	56	0.8	392	10.4			11.2
2	16	1.3	160	7.5			8.8
3	80	1.2	120	10.2			11.4
4	55	1.3	550	9.4			10.7
5	26	1.8	130	10.8			12.6
6	45	1.8	1800	6.3			8.1
7	60	1.6	900	5.6			7.2
8	88	1.7	616	20.4			22.1
9	38	1.8	570	3.6			5.4

From the results it is observed that the top soil thickness ranges from 0.8 to 1.8 m. and its resistivity ranges from 16 to 88 ohm.m followed by the second layer which may be weathered rock of thickness ranging from 3.6 to 20.4 m and its resistivity ranges from 120 to 1800 ohm.m. followed by Geo-electrical basement.

Based on the above results four dug wells are recommended at VES-1, VES-2, VES-3 and VES-4.

"EVERY DROP OF WATER COUNTS, SAVE IT"

CONCLUSIONS & RECOMMENDATIONS:

The proposed industrial unit of M/s. Crux Bio-tech India (Pvt.) Limited has mentioned in their common application, the requirement of water quantity is 800 kl/day for running the unit. After satisfying the spacing norms and based on the results of integrated surveys, four open wells are recommended and also accorded the permission for drawl of Ground water 250 KL/day through the four open wells. The recommendations are given hereunder.

TABLE

S.No.	Recommended VES No.	Geo-coordinates	Type of well	Dimensions	Total depth	Expected yield
1	1	$16^0$45'43.9" $80^0$09'3.9"	Open well	10x10 m.	8.00 m	65,000 lpd
2	2	$16^0$45'41" $80^0$09'7.8"	Open well	10x10 m.	8.00 m.	65,000 lpd
3	3	$16^0$45'47.7" $80^0$09'0.9"	Open well	10x10 m.	8.00 m.	60,000 lpd
4	4	$16^0$45'55.7" $80^0$09'1.4"	Open well	10x10 m.	8.00 m.	60,000 lpd

*** lpd – liters per day**

Before going to commission the proposed industrial unit, the management shall be abided by the following terms and conditions and submit their consent to the department within one month. And "**the recommendations hold good only subject to the rainfall conditions and stage of development of the area in and around in the long run**".

- The recommended open wells should be constructed at the places specified (Geo-coordinates) by the department in the report and constructed to the recommended depth only (Plate-I & II enclosed herewith).
- No permission to use the existing bore wells at any circumstances.

- The proposed industrial unit is restricted to draw a total quantity of 250 kl/day through the permitted newly constructed open wells.
- After constructing, the management has to take up steps for the registration of the open wells and unutilized bore wells under APWALTA.
- The existing unutilized 4 bore wells must be put in use for the monitoring of water levels periodically in the months of January, March, May, July, September and November and also maintain the water level register.
- The quality of Ground water should be ascertained and submit the chemical analysis data to Ground Water Department twice in a year i.e., May & November and also maintain the register of water quality.
- Half yearly reports on the above said (water level data and quality data) should be sent to the District Deputy Director, Ground Water Department concerned.
- The effluents must be treated properly and must be free from all toxic materials, turbidity, colour, odour etc.,
- The effluents should not be letout into either surface or Ground water bodies.
- The management of the proposed unit must harvest the rain water from rooftop and storm water drains to recharge the Ground water.

"HARVEST RAIN WATER – RECHARGE GROUND WATER"

- Suitable Artificial Recharge structures like Check dams, Gully plugs, Rock fill dams, Mini percolation tanks, Grabin structures etc., must be constructed in and around to augment the Ground water table.
- The officials of the Ground Water Department must be allowed to inspect the plant area whenever necessary.
- The Govt. of Andhra Pradesh/ Ground Water Department reserve the right to stop the unit from using Ground water during the emergencies or whenever the unit deviates from the terms and conditions.

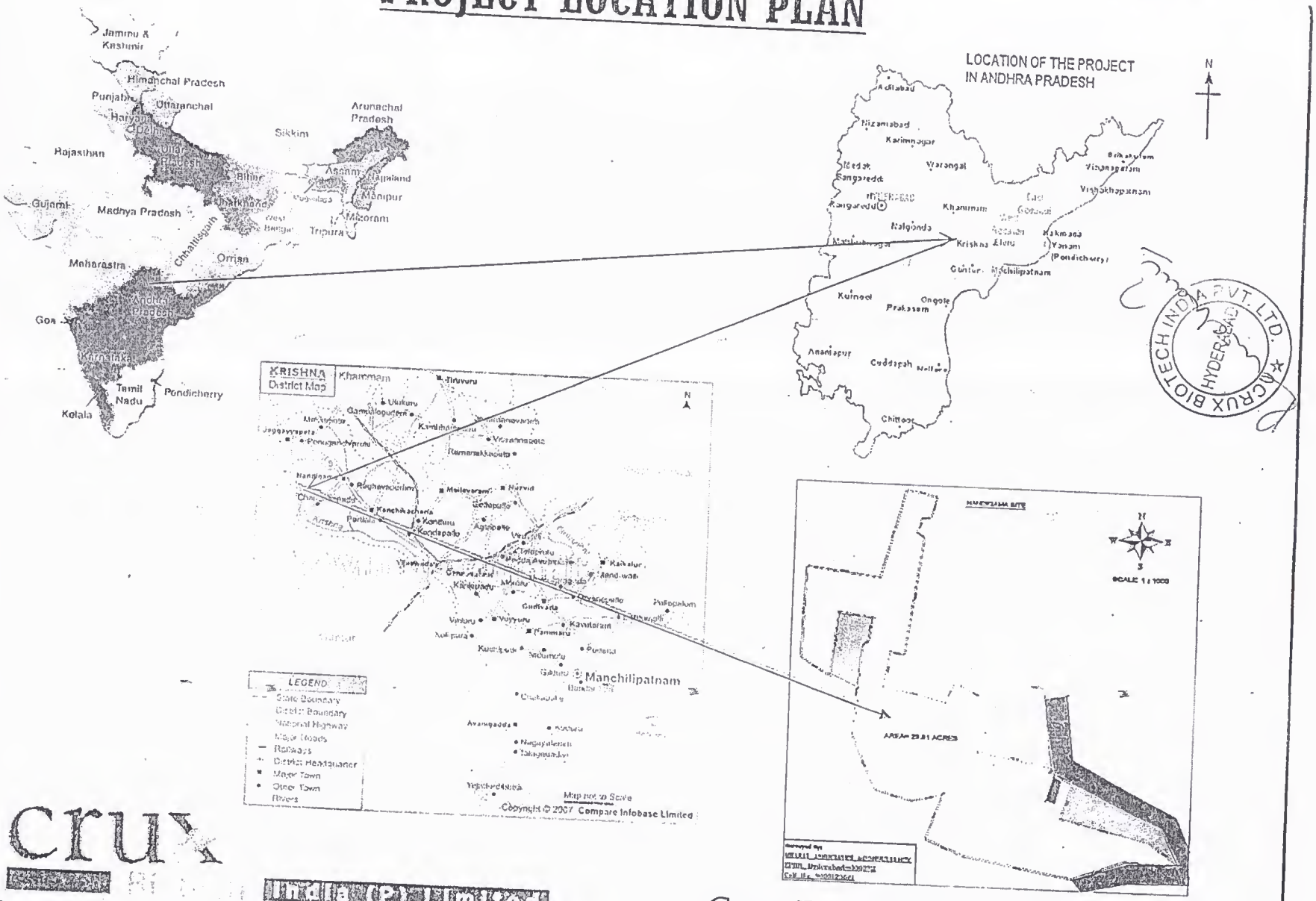
DEPUTY DIRECTOR,
GROUND WATER DEPARTMENT,
VIJAYAWADA.

/Chary/

Plate - I

ANNEXURE - V

PROJECT LOCATION PLAN



CRUX

India (P) Limited

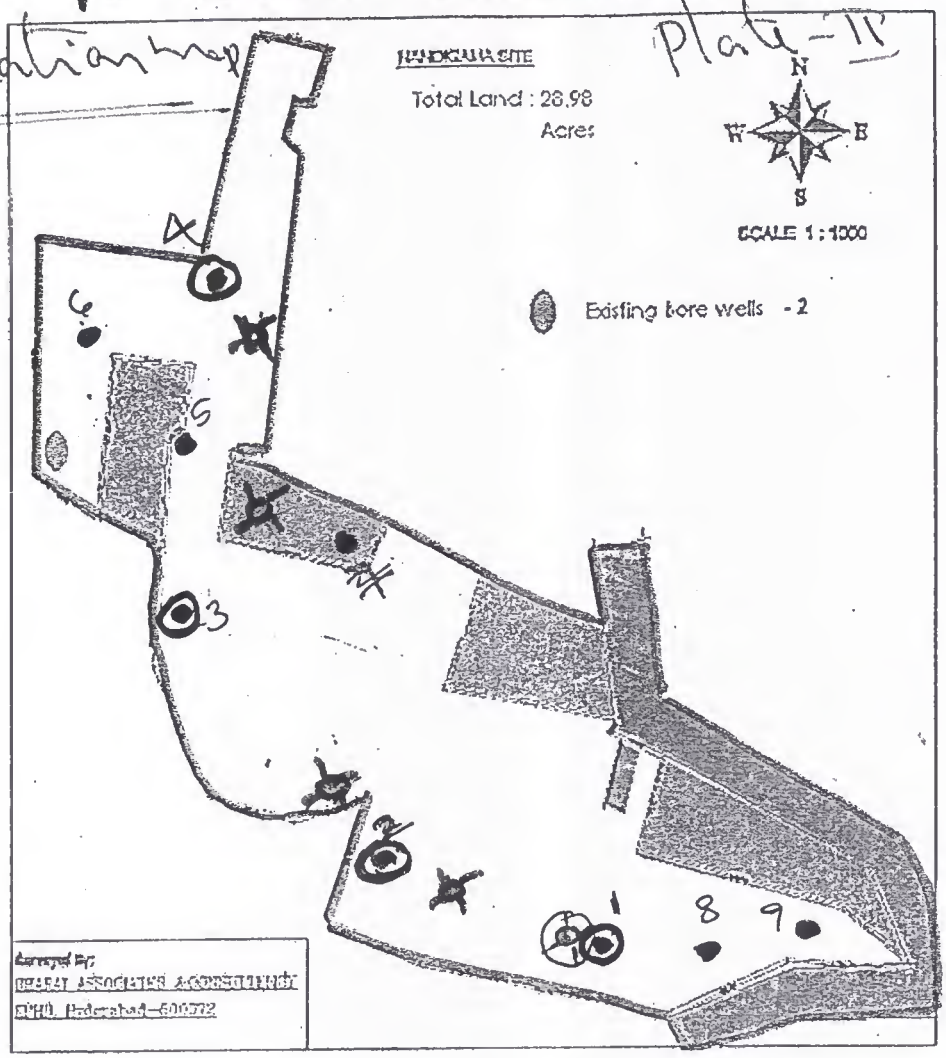
Crux Boitech India (P) Limited

CRUX BIOTECH INDIA PVT. LTD. HYDERABAD

M/s CRUX biotech India Pvt. Ltd

Location map

Plate-II



Not to Scale

Peddavaram (V)
Nandigama (T)
Krishna (Dt).

INDEX

- VES conducted
- VES recommended
- Existing bore wells
- Borehole (casing pipe removed)

GOVERNMENT OF ANDHRA PRADESH
ABSTRACT

CDDC - Industrial Water Supply to M/s. CRUX-BIO Tech India Pvt. Ltd., Sy.No.530, 531, Peddavaram(V), Nandigama(M), Krishna District - Permission for drawal of 0.0103 TMC of Water per year from Krishna River – Accorded – Orders – Issued.

IRRIGATION & CAD (PW-REFORMS) DEPARTMENT

G.O.Ms.No.98. Dated:26-10-2013.

READ:

From the ENC(Irrigation), Hyderabad, Lr.No.ENC(I)/DCEIV/OTM5/S2/184/2011, dated: 29-07-2011.

>><<

ORDER:

In the reference read above, the Engineer-in-Chief(Irrigation) has submitted proposals for permission to draw 0.0103 TMC or 800 KL per day/10.30 Mcft of water per annum from Krishna River under the provision of Industrial allocation to M/s.Crux Bio Tech India Private Limited in Sy.Nos.530, 531, Peddavaram(V), Nandigama(M), Krishna District during floods seasons only, keeping in view of Industrial growth and the requirement of water in meagre, subject to payment of Royalty charges & concurrence of District Collector, Krishna District and clearance of Pollution Control Board.

2. Government after careful examination hereby accord permission for drawal 0.0103 TMC or 800 KL per day/10.30 Mcft of water per annum from Krishna River under the provision of Industrial allocation to M/s.Crux Bio Tech India Private Limited in Sy.Nos.530, 531, Peddavaram(V), Nandigama(M), Krishna District during floods seasons only, keeping in view of Industrial growth and the requirement of water in meagre, subject to payment of Royalty charges & concurrence of District Collector, Krishna District and clearance of Pollution Control Board and also subject to the following terms and conditions:-

1) The annual requirement of 0.0103 TMC of water per annum from the Krishna River during flood seasons only, keeping in view the meager water requirement

2) The water drawn from the river should be utilized for the purpose for which permission is granted. Any misuse in this regard will entail cancellation of the permission without any notice and liable for imposition of penalty.

3) The entire cost of infrastructure to draw water shall be borne by the industry only.

4) Water meters or suitable approved measuring devices should be installed by the industry at their own cost to measure the water consumed and water measuring devices should be kept under the control of Irrigation & CAD Department and the representatives of the user shall be present at all times for taking readings.

5) The industry should pay water rate at the existing rates and subject to revision by the Government from time to time. In case of failure to pay water rate, royalty, the permission to draw water shall stands cancelled.

P.T.O.,

6) No field bodhi or pipeline shall be taken through or along with Government land without approval of Government and if permission is accorded by the Government the lease of Government land should be paid as fixed by the Government only.

7) The industry should obtain the prior concurrence of concerned Department for laying pipeline and for crossing etc.

8) The industry should make their own arrangements for supplementation of water in their premises only.

9) The industry should make their own arrangements to dispose the treated effluents as per norms of Andhra Pradesh Pollution Control Board in their premises only and should obtain prior permission if any needed from Government to dispose treated effluents in the natural resources.

10) The Irrigation & CAD Department reserves the right for cancellation of the permission without assigning any reasons thereof.

11) The Irrigation & CAD Department is no way responsible of non- supply / Non Availability of water due to any reasons in any particular water year.

12) The Industry must strengthen the canal/river margin 100 Mts or as decided by the I&CAD Dept., on either side of the proposed off take point to avoid slips, erosion of banks and to protect existing margins as directed by the Department.

13) The industry should lay the pipeline duly leaving not less than 1.00 Mts., from the toe of the flood bank.

14) The industry has to construct CC walls to avoid leakages at pipe line crossings.

15) The industry should follow the Revenue Board Standing orders (B.S.O).

16) The industry should pay security deposit at 2.5 % on 10 years water charges for which permission is granted.

17) The permission accorded shall be initially for a period of 5 years only. The permission shall have to be renewed well in advance before the expiry of the permission.

18) The Industry shall pay one year water charges as advance and amounts due to the Department before entering into agreement.

19) The industry should make its own arrangements creating storage facilities for the requirement of water 0.0103 TMC during the flood period.

20) The present rate of royalty charges as per the G.O.Ms.No.39, I&CAD Department, Dated:02-04-2002 is Rs.4.50 per 1000 gallons for consumptive use. The water royalty charges are likely to be revised by the Government from time to time and the industry shall pay the revised rates as fixed by the Government from time to time.

Contd.. 3.,

21) The firm has to pay the water charges for the estimated quantity in advance at the start of the Finance Year (i.e) before 10th April every year as per BSO.

22) The consumptive utilization of 0.0103 TMC of annual requirement as required should not be exceeded under any circumstances.

23) A detailed plan showing the location, the intake arrangements, conveyance system etc., shall be furnished to the Department.

24) The industry shall abide any other conditions laid down by the Government/ Department from time to time.

25) The permission does not confer any riparian right to the industry.

26) Non adherence of any of the conditions by the industry entails cancellation of the permission without any notice.

3. In addition to the above, the following conditions may also be kept in view:-

i) The quantity of water to be actually permitted for the drawal shall be as certified by the Industries Department.

ii) The industry shall obtain all the necessary clearances required.

iii) Water storage facility with a minimum capacity of 0.00515 TMC within the premises of the unit shall be constructed to the satisfaction of the I&CAD Department before the Industry is granted the permission to utilize the water.

iv) The point of drawal of water shall be kept above the FRL/normal flood level.

v) The pump house shall be constructed at the point of drawal and I&CAD Department shall carry out regular inspections to curb any unauthorized drawal of water during the non-monsoon period.

vi) The department will be responsible for positioning appropriate and fool proof safe guards ensuring that under no circumstances shall the Industry draw water during the non-flood season.

vii) Willfull and proven unauthorized tapping of water in non-flood season or in excess of the quantity authorized, in violation of the conditions under which the permission is granted, shall besides the cancellation of the permission granted, invite penal action, as per the law of land.

4. The Engineer-in-Chief(Irrigation), Hyderabad shall take necessary action accordingly.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

ADITYA NATH DAS,
PRINCIPAL SECRETARY TO GOVERNMENT.

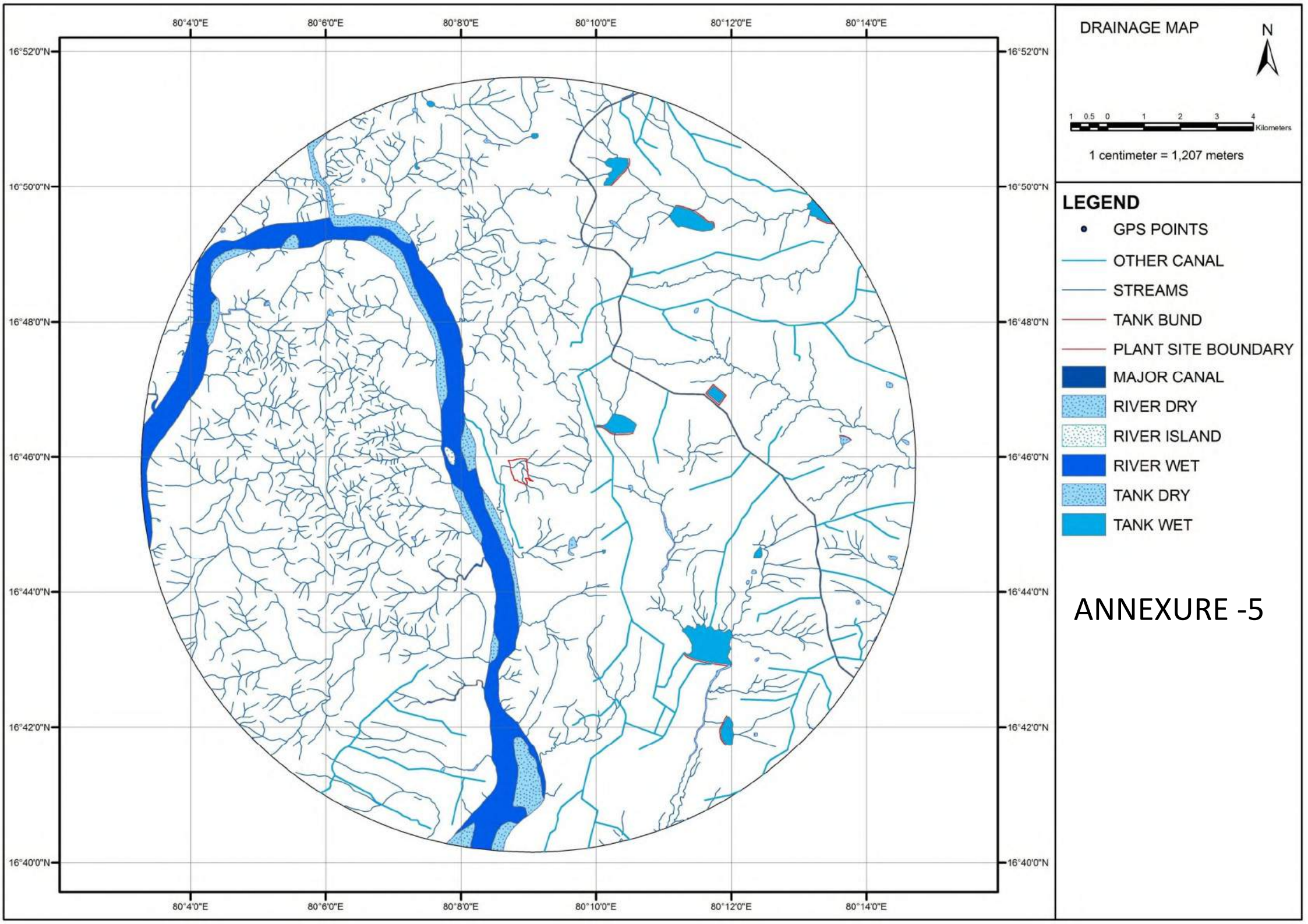
To
The Engineer-in-Chief(Irr.), I&CAD Department,
Errum Munzil, Jalasouda Buildings, Hyderabad.
The Collector & District Magistrate, Krishna District at Machilipatnam.
The Managing Director, A.P. Pollution Control Board, Hyderabad.

P.T.O.,

The Superintending Engineer, Irrigation Circle, Vijayawada.
Copy to:
The Commissioner of Industries, A.P., Hyderabad.
The O.S.D. to Minister for Major & Medium Irrigation.
The Special Secretary to C.M.
M/s. Crux Bio Tech India Pvt. Ltd., H.No.8-3-222/C/1, A-26, Madhura Nagar, Ameerpet, Hyderabad-500 038.
SF/SC.

//FORWARDED :: BY ORDER//

I. Satyanarayana
SECTION OFFICER.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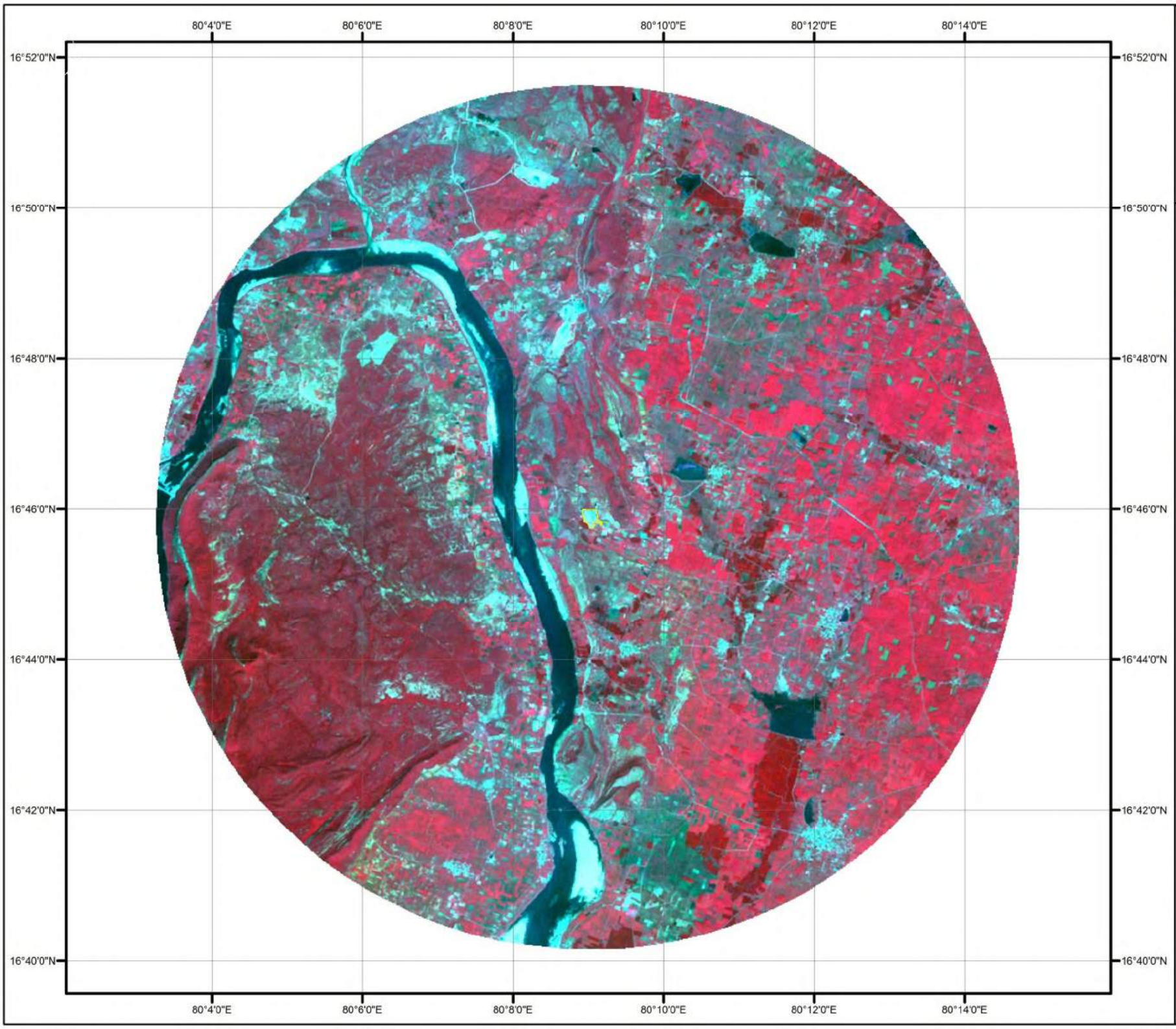
1 0.5 0 1 2 3 4
Kilometers
1 centimeter = 1,207 meters
LEGEND
GPS POINTS
OTHER CANAL
STREAMS
TANK BUND
PLANT SITE BOUNDARY
MAJOR CANAL
RIVER DRY
RIVER ISLAND
RIVER WET
TANK DRY
TANK WET
ANNEXURE -5
80°4'0"E
80°6'0"E
80°8'0"E
80°10'0"E
80°12'0"E
80°14'0"E
16°52'0"N
16°50'0"N
16°48'0"N
16°46'0"N
16°44'0"N
16°42'0"N
16°40'0"N



IRS RS-2 SATELLITE IMAGERY SHOWING SITE SUROUNDINGS

N

1 0.5 0 1 2 3 4 Kilometers

1 centimeter = 1,205 meters

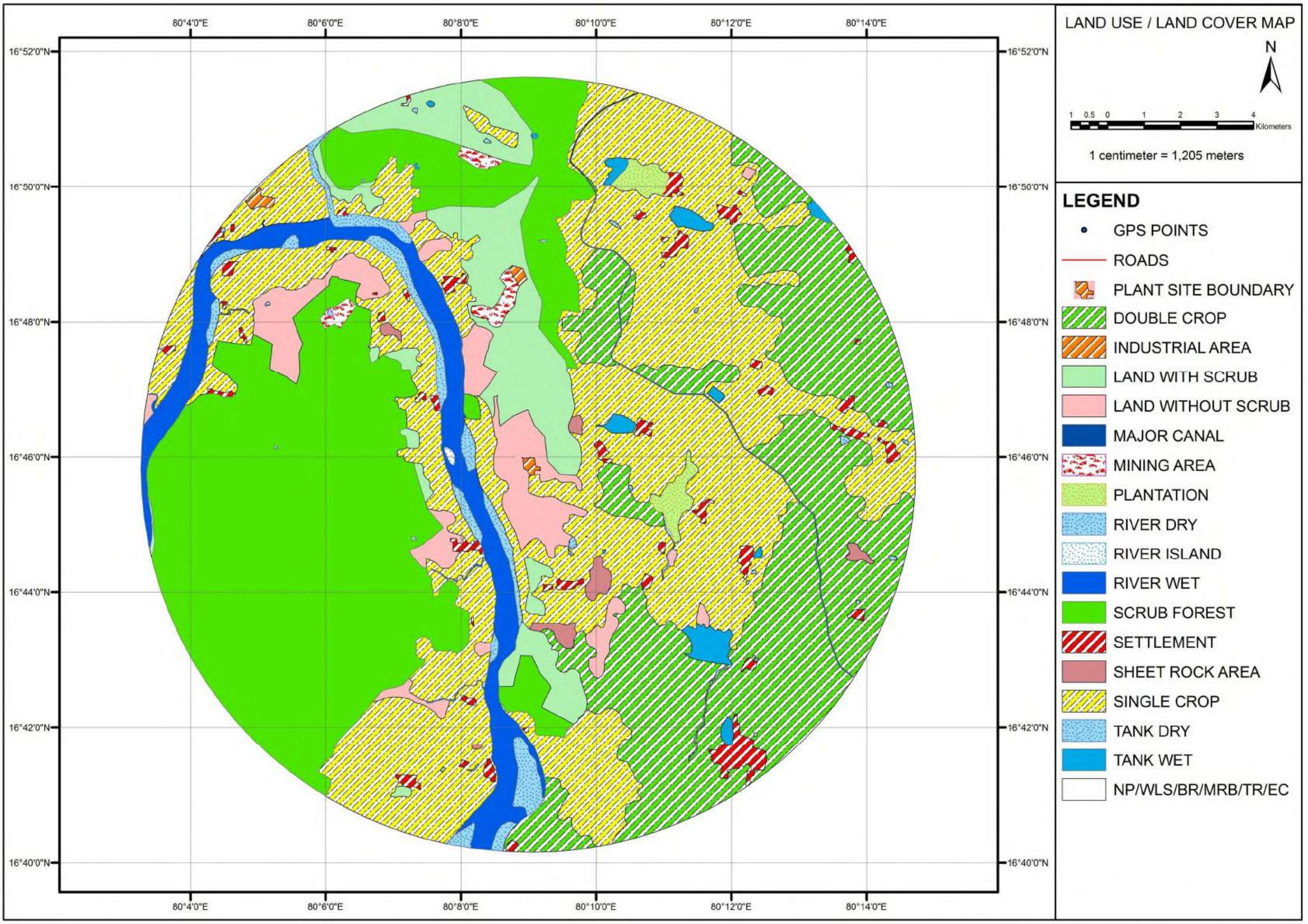
LEGEND

- GPS POINTS
- PLANT SITE BOUNDARY

RGB

- Red: Layer_3
- Green: Layer_2
- Blue: Layer_1

ANNEXURE - 6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16°50'0"N
16°48'0"N
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16°44'0"N
16°42'0"N
16°40'0"N
LAND USE / LAND COVER MAP
N
1 0.5 0 1 2 3 4
Kilometers
1 centimeter = 1,205 meters
LEGEND
GPS POINTS
ROADS
PLANT SITE BOUNDARY
DOUBLE CROP
INDUSTRIAL AREA
LAND WITH SCRUB
LAND WITHOUT SCRUB
MAJOR CANAL
MINING AREA
PLANTATION
RIVER DRY
RIVER ISLAND
RIVER WET
SCRUB FOREST
SETTLEMENT
SHEET ROCK AREA
SINGLE CROP
TANK DRY
TANK WET
NP/WLS/BR/MRB/TR/EC

ANNEXURE -7

CRUX BIOTECH INDIA PRIVATE LIMITED

AMBIENT AIR QUALITY DATA

(SAMPLING PERIOD: DECEMBER, 2016-FEBRUARY, 2017)

Units:µg/m3

Sampling Location 1:Plant site					
DATE	$PM_{2.5}$	PM_{10}	SO_2	NO_X	CO
1-Dec-16	33.7	51.7	11.3	12.5	423
2-Dec-16	34.0	52.4	11.5	12.2	435
8-Dec-16	33.8	53.2	11.4	11.9	447
9-Dec-16	33.9	54.6	11.6	11.8	455
22-Dec-16	33.7	55.0	11.8	12.0	466
23-Dec-16	33.5	55.7	12.0	12.1	472
29-Dec-16	33.2	56.7	12.5	12.4	480
30-Dec-16	32.9	55.8	12.7	12.9	487
4-Jan-17	32.6	54.3	12.5	12.7	497
5-Jan-17	32.2	53.4	12.3	12.5	507
11-Jan-17	31.8	52.7	12.0	12.3	511
12-Jan-17	31.6	51.0	11.7	11.8	529
18-Jan-17	31.4	50.4	11.5	12.1	547
19-Jan-17	31.2	49.8	11.3	12.5	568
25-Jan-17	30.9	48.9	11.1	12.7	560
27-Jan-17	30.5	49.7	10.9	13.0	552
1-Feb-17	30.3	48.9	10.7	13.2	543
2-Feb-17	30.0	49.3	10.5	13.5	532
8-Feb-17	29.7	50.7	10.6	13.5	525
9-Feb-17	29.4	51.4	10.8	13.8	513
15-Feb-17	29.8	50.9	11.0	14.0	508
16-Feb-17	30.1	51.3	11.2	14.3	499
22-Feb-17	30.5	52.4	11.3	14.7	485
23-Feb-17	30.8	53.2	11.1	14.9	474
Max	34.0	56.7	12.7	14.9	568
Min	29.4	48.9	10.5	11.8	423
98 percentile	34.0	56.7	12.7	14.9	568

Units : µg/m3

Sampling Location 2:Peddavaram					
DATE	$PM_{2.5}$	PM_{10}	SO_2	NO_X	CO
1-Dec-16	15.5	28.6	9.0	10.2	380
2-Dec-16	15.2	29.0	9.1	10.1	387
8-Dec-16	14.8	29.3	9.2	9.9	394
9-Dec-16	14.5	29.6	9.4	10.0	103
22-Dec-16	14.6	30.0	9.3	10.2	410
23-Dec-16	14.3	31.5	9.1	10.3	401
29-Dec-16	14.7	31.1	8.9	10.5	395
30-Dec-16	15.2	29.7	9.0	10.6	388
4-Jan-17	15.5	29.5	9.2	10.8	380
5-Jan-17	15.8	29.2	9.4	11.0	374
11-Jan-17	16.1	28.7	9.5	11.2	369
12-Jan-17	16.4	28.4	89.7	11.5	362
18-Jan-17	16.7	28.0	9.8	11.7	357
19-Jan-17	17.0	27.7	10.0	11.6	351
25-Jan-17	17.2	27.3	10.1	11.4	348
27-Jan-17	17.4	27.1	9.8	11.5	342
1-Feb-17	17.8	26.8	9.6	11.4	337
2-Feb-17	18.0	26.4	9.8	11.3	331
8-Feb-17	18.2	26.1	9.7	11.1	325
9-Feb-17	18.5	25.7	9.5	10.9	334
15-Feb-17	18.9	25.3	9.2	10.8	341
16-Feb-17	18.4	24.9	9.1	10.7	350
22-Feb-17	18.0	24.4	8.9	10.8	358
23-Feb-17	17.7	23.9	9.0	10.9	365
Max	18.9	31.5	10.1	11.7	410
Min	14.3	23.9	8.9	9.9	325
98 percentile	18.9	31.5	10.1	11.7	410

Units : µg/m3

Sampling Location 3: Lakshmipuram					
DATE	$PM_{2.5}$	PM_{10}	SO_2	NO_X	CO
1-Dec-16	15.3	26.8	9.0	**10.4**	362
2-Dec-16	**17.1**	**28.6**	**9.5**	10.0	358
8-Dec-16	15.7	27.5	9.1	10.1	**374**
9-Dec-16	14.5	25.5	9.3	**10.4**	370
22-Dec-16	15.0	26.4	8.9	9.9	368
23-Dec-16	14.7	25.8	8.4	10.0	355
29-Dec-16	16.3	**28.6**	**7.9**	9.8	366
30-Dec-16	**17.1**	28.1	8.0	9.5	348
4-Jan-17	15.6	27.3	8.2	9.6	325
5-Jan-17	14.8	25.9	8.4	9.3	**315**
11-Jan-17	13.5	23.7	8.7	**9.1**	332
12-Jan-17	15.8	27.7	8.9	9.3	318
18-Jan-17	14.8	25.9	**9.5**	9.5	322
19-Jan-17	13.8	24.2	9.3	9.8	344
25-Jan-17	13.4	23.5	9.0	9.5	329
27-Jan-17	**12.8**	21.4	9.2	9.6	335
1-Feb-17	13.0	22.8	8.8	9.9	344
2-Feb-17	14.6	25.6	9.1	10.1	358
8-Feb-17	15.4	27.1	8.7	**10.4**	362
9-Feb-17	15.3	26.9	9.0	10.0	370
15-Feb-17	16.3	**28.6**	8.6	10.3	365
16-Feb-17	15.8	27.8	8.8	9.8	**374**
22-Feb-17	14.9	26.1	8.9	10.1	368
23-Feb-17	15.6	27.3	9.0	10.0	370
Max	17.1	28.6	9.5	10.4	374
Min	12.8	21.4	7.9	9.1	315
98 percentile	17.1	28.6	9.5	10.4	374

Units:µg/m3

Sampling Location 4:Ramannapeta					
DATE	$PM_{2.5}$	PM_{10}	SO_2	NO_X	CO
1-Dec-16	27.4	**47.2**	10.1	11.8	463
2-Dec-16	26.1	45.8	10.0	**12.4**	456
8-Dec-16	**28.3**	47.0	9.8	12.0	470
9-Dec-16	26.4	46.4	**10.3**	11.9	462
22-Dec-16	24.8	43.5	10.1	11.3	**473**
23-Dec-16	25.5	44.8	9.9	11.8	455
29-Dec-16	26.1	45.8	10.0	12.2	437
30-Dec-16	26.8	47.1	9.7	12.0	428
4-Jan-17	26.6	46.7	9.8	**12.4**	411
5-Jan-17	**28.3**	**47.2**	9.6	12.1	394
11-Jan-17	26.2	45.9	9.4	12.1	415
12-Jan-17	26.3	46.1	**9.1**	12.3	435
18-Jan-17	25.9	45.5	9.5	11.9	445
19-Jan-17	26.6	46.6	9.2	11.5	454
25-Jan-17	26.9	**47.2**	9.7	11.7	448
27-Jan-17	26.8	47.0	9.9	11.4	467
1-Feb-17	25.7	45.1	10.2	11.0	470
2-Feb-17	24.4	42.8	10.0	**10.4**	**473**
8-Feb-17	**23.3**	40.8	9.9	11.1	455
9-Feb-17	**23.3**	**38.9**	**10.3**	10.8	466
15-Feb-17	23.4	41.1	9.8	11.0	470
16-Feb-17	24.6	43.2	10.0	11.2	468
22-Feb-17	25.1	44.1	9.9	10.7	**473**
23-Feb-17	25.8	45.2	9.7	11.1	465
Max	28.3	47.2	10.3	12.4	473
Min	23.3	38.9	9.1	10.4	394
98 percentile	28.3	47.2	10.3	12.4	473

Unit:µg/m3

Sampling Location 5: Toduvayai					
DATE	$PM_{2.5}$	PM_{10}	SO_2	NO_X	CO
4-Dec-16	17.1	**29.4**	7.8	8.3	327
5-Dec-16	**17.6**	29.3	8.2	8.6	330
11-Dec-16	16.7	28.8	8.0	8.0	322

Units:µg/m3

Sampling Location 6: Challagariga					
DATE	$PM_{2.5}$	PM_{10}	SO_2	NO_X	CO
4-Dec-16	15.0	25.8	7.0	8.7	318
5-Dec-16	15.5	**26.7**	7.5	8.5	315
11-Dec-16	14.8	25.6	7.2	8.8	306

12-Dec-16	16.5	28.5	**8.4**	8.2	**334**
18-Dec-16	16.0	27.5	8.3	**7.8**	327
19-Dec-16	16.2	27.9	8.1	7.9	314
26-Dec-16	16.4	28.2	**8.4**	8.3	322
28-Dec-16	17.1	**29.4**	7.9	8.7	315
1-Jan-17	16.5	28.5	8.2	8.5	311
2-Jan-17	16.9	29.1	8.0	8.8	327
8-Jan-17	16.8	29.0	7.8	8.4	332
9-Jan-17	**17.6**	**29.4**	7.6	9.0	**334**
22-Jan-17	16.7	28.8	7.7	8.8	328
23-Jan-17	15.5	26.7	7.5	**9.2**	318
29-Jan-17	15.7	27.1	7.3	8.9	328
30-Jan-17	15.0	25.8	**6.9**	9.1	330
4-Feb-17	14.9	24.8	7.4	9.0	**334**
5-Feb-17	14.8	23.9	7.8	8.9	321
11-Feb-17	14.0	24.1	7.3	9.1	312
12-Feb-17	14.7	**23.7**	7.9	**9.2**	308
18-Feb-17	**14.6**	25.2	8.2	8.7	301
19-Feb-17	14.7	24.9	8.0	8.6	**287**
25-Feb-17	15.5	26.8	8.1	9.0	292
26-Feb-17	15.8	27.3	8.3	8.9	299
Max	17.6	29.4	8.4	9.2	334
Min	14.6	23.7	6.9	7.8	287
98 percentile	17.6	29.4	8.4	9.2	334

12-Dec-16	14.4	24.8	**6.9**	9.0	**320**
18-Dec-16	13.5	22.5	7.3	8.9	314
19-Dec-16	12.6	**21.0**	7.4	9.0	302
26-Dec-16	12.9	21.5	7.5	8.7	318
28-Dec-16	12.9	22.3	7.8	**9.1**	311
1-Jan-17	**12.6**	**21.0**	7.8	8.9	308
2-Jan-17	12.7	21.9	7.6	8.4	310
8-Jan-17	13.1	22.5	**8.2**	8.6	**320**
9-Jan-17	14.0	24.1	7.9	9.0	315
22-Jan-17	13.8	23.8	8.0	8.9	311
23-Jan-17	14.7	25.4	7.7	8.8	305
29-Jan-17	**16.1**	26.2	7.9	**9.1**	288
30-Jan-17	14.6	25.1	8.0	8.9	295
4-Feb-17	14.1	24.3	7.8	8.7	299
5-Feb-17	15.0	25.9	**8.2**	8.4	280
11-Feb-17	15.3	26.4	7.9	8.5	**275**
12-Feb-17	15.1	26.0	8.1	8.1	282
18-Feb-17	15.5	**26.7**	8.0	8.7	277
19-Feb-17	**16.1**	26.5	7.7	8.3	280
25-Feb-17	15.0	25.8	7.9	**7.9**	283
26-Feb-17	15.2	26.2	8.0	8.0	295
Max	16.1	26.7	8.2	9.1	320
Min	12.6	21	6.9	7.9	275
98 percentile	16.1	26.7	8.2	9.1	320

Units:µg/m3

Sampling Location 7: Vedadri					
DATE	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**NO_X**	**CO**
4-Dec-16	18.2	**31.4**	8.1	9.7	375
5-Dec-16	**18.8**	31.1	8.3	9.6	382
11-Dec-16	16.9	29.2	**8.0**	10.2	380
12-Dec-16	16.3	28.1	8.5	9.9	370
18-Dec-16	15.5	26.8	8.7	10.0	**385**
19-Dec-16	**14.9**	25.2	8.3	10.1	378
26-Dec-16	15.3	26.4	8.9	10.5	360
28-Dec-16	**14.9**	**24.9**	9.1	10.3	348
1-Jan-17	15.0	25.8	8.7	**10.7**	322

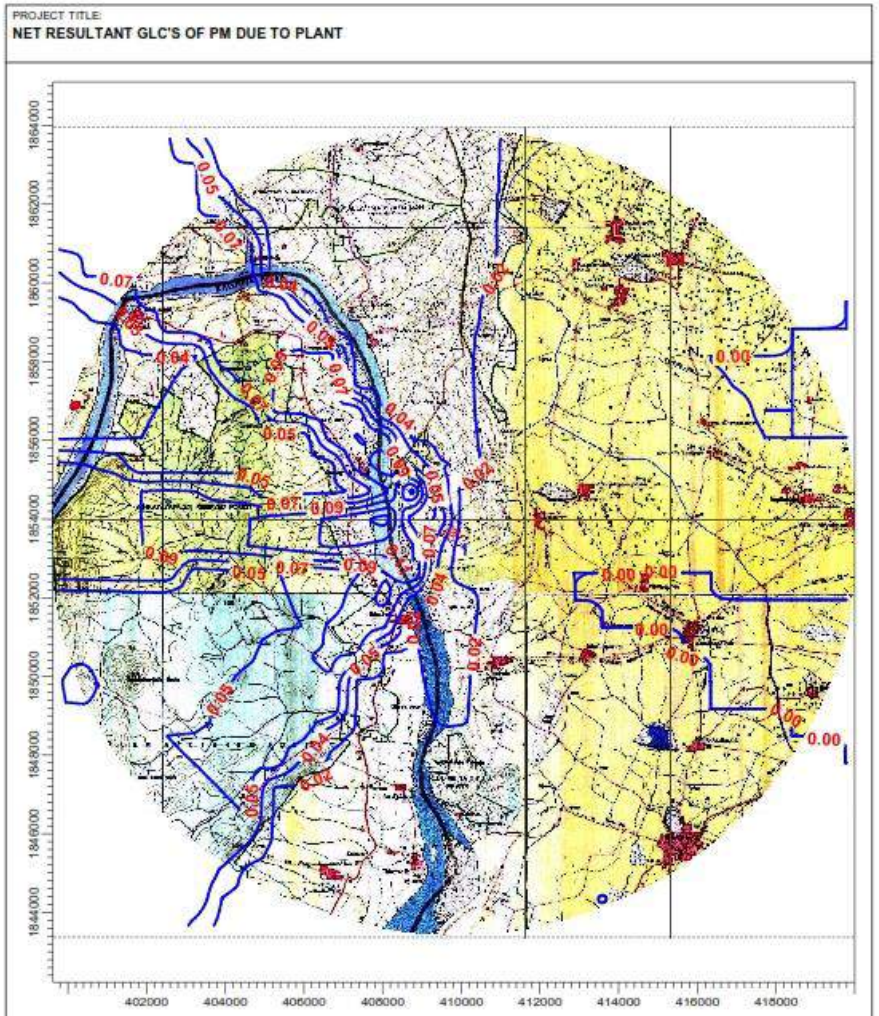
Units:µg/m3

Sampling Location 8: Bandipalem					
DATE	**$PM_{2.5}$**	**PM_{10}**	**SO_2**	**NO_X**	**CO**
4-Dec-16	23.1	37.2	**9.9**	10.9	394
5-Dec-16	22.3	38.5	9.7	10.7	388
11-Dec-16	22.2	37.0	9.4	11.0	395
12-Dec-16	**22.0**	36.9	9.0	10.6	400
18-Dec-16	22.3	37.2	9.2	**11.2**	392
19-Dec-16	22.7	39.1	9.0	10.9	**406**
26-Dec-16	22.2	38.2	8.8	10.7	385
28-Dec-16	**22.0**	**36.7**	8.6	11.0	392
1-Jan-17	22.9	37.5	8.9	10.8	375

2-Jan-17	15.7	27.1	9.0	10.3	311
8-Jan-17	15.4	26.5	9.2	10.6	**304**
9-Jan-17	15.1	24.8	9.5	10.5	322
22-Jan-17	16.1	27.7	**9.8**	10.2	318
23-Jan-17	16.4	28.2	9.3	10.5	335
29-Jan-17	14.8	25.5	9.7	**10.7**	344
30-Jan-17	16.1	27.8	9.5	10.4	365
4-Feb-17	17.4	30.0	9.4	10.5	356
5-Feb-17	16.9	29.2	**9.8**	10.1	360
11-Feb-17	16.1	27.8	9.3	9.9	372
12-Feb-17	**18.8**	**31.4**	9.6	10.3	368
18-Feb-17	17.2	29.6	9.2	10.0	382
19-Feb-17	17.7	30.5	9.0	9.8	380
25-Feb-17	18.2	**31.4**	9.4	**9.5**	**385**
26-Feb-17	17.3	29.8	9.1	9.7	377
Max	18.8	31.4	9.8	10.7	385
Min	14.9	24.9	8	9.5	304
98 percentile	18.8	31.4	9.8	10.7	385

2-Jan-17	22.6	39.0	**8.5**	10.6	388
8-Jan-17	23.3	40.2	8.8	10.0	392
9-Jan-17	24.1	41.5	9.0	10.5	**406**
22-Jan-17	24.5	42.2	8.9	10.3	385
23-Jan-17	25.9	**44.7**	8.7	10.2	399
29-Jan-17	25.2	43.5	9.1	9.8	378
30-Jan-17	24.6	42.4	9.3	10.0	370
4-Feb-17	24.1	41.5	9.7	**9.4**	365
5-Feb-17	25.2	43.5	9.5	9.8	362
11-Feb-17	25.6	44.1	**9.9**	10.2	377
12-Feb-17	24.8	42.8	9.7	10.0	368
18-Feb-17	**26.8**	**44.7**	9.6	10.5	**358**
19-Feb-17	25.2	43.5	9.8	10.7	370
25-Feb-17	24.9	42.9	9.5	10.9	375
26-Feb-17	**26.8**	44.5	9.3	**11.2**	381
Max	26.8	44.7	9.9	11.2	406
Min	22	36.7	8.5	9.4	358
98 percentile	16	26.7	9.9	11.2	406

ANNEXURE - 8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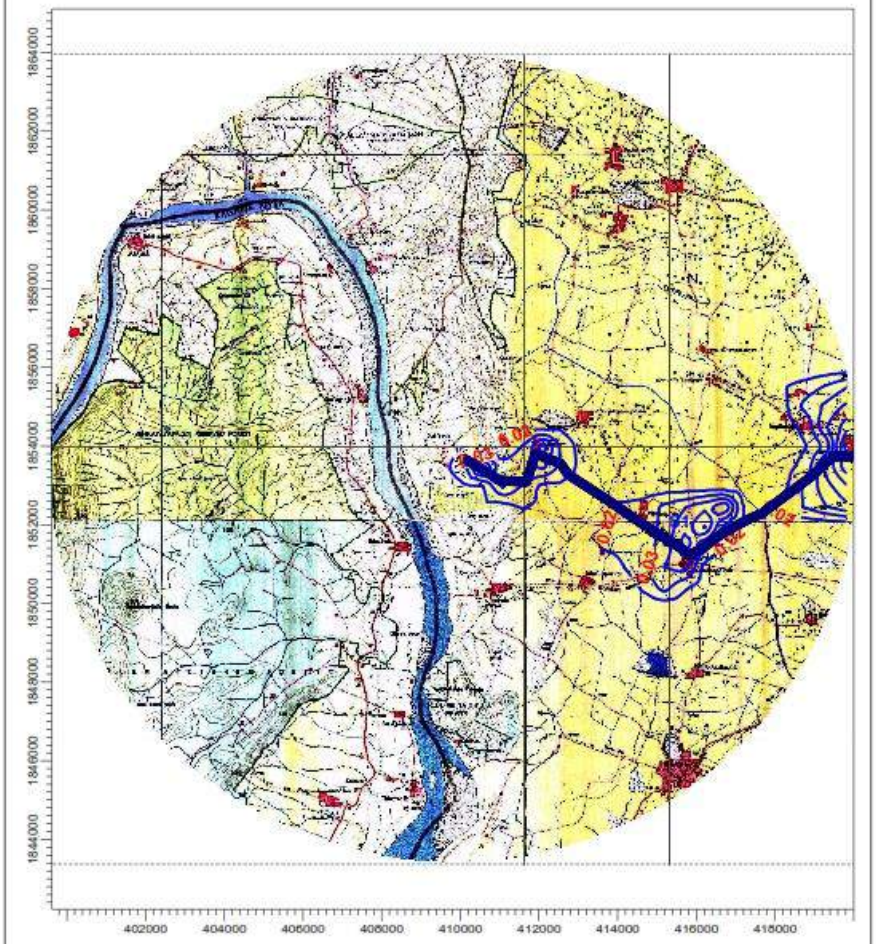
1846000
1844000
402000
404000
406000
408000
410000
412000
414000
416000
418000
SOURCES
1
M/s CRUX BIOTECH INDIA (P) LIMITED
RECEPTORS
1600
Concentration
SCALE:
1:115,000
0
4 km
MAX:
0.16025 ug/m^3
AERMOD View - Lakes Environmental Software

PROJECT TITLE:

NET RESULTANT GLC'S OF PM DUE TO VEHICULAR EMISSIONS



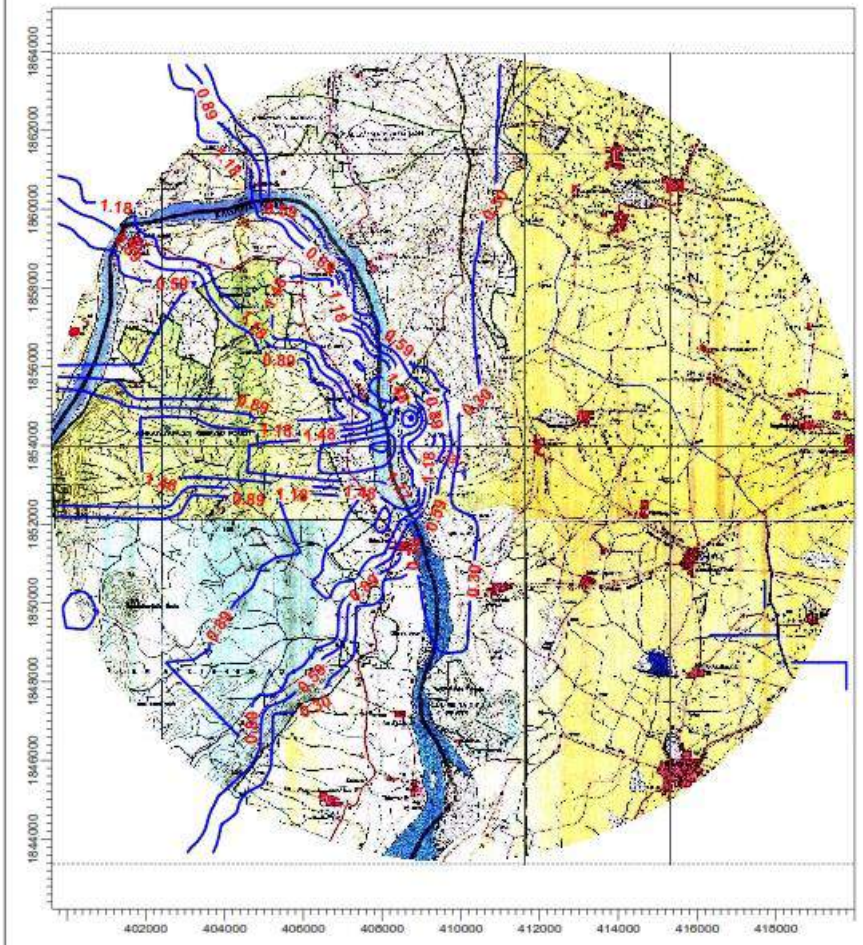
SOURCES: 1	M/s CRUX BIOTECH INDIA (P) LIMITED	
RECEPTORS: 1600		
Concentration	SCALE: 1:115,000 (0 — 4 km)	
MAX: 0.15193 ug/m^3		

AERMOD View - Lakes Environmental Software

G:\Modeling Projects\CRUX BIO EXPANSION\PM\PM.inc

PROJECT TITLE:

NET RESULTANT GLC'S OF SO2 DUE TO PLANT



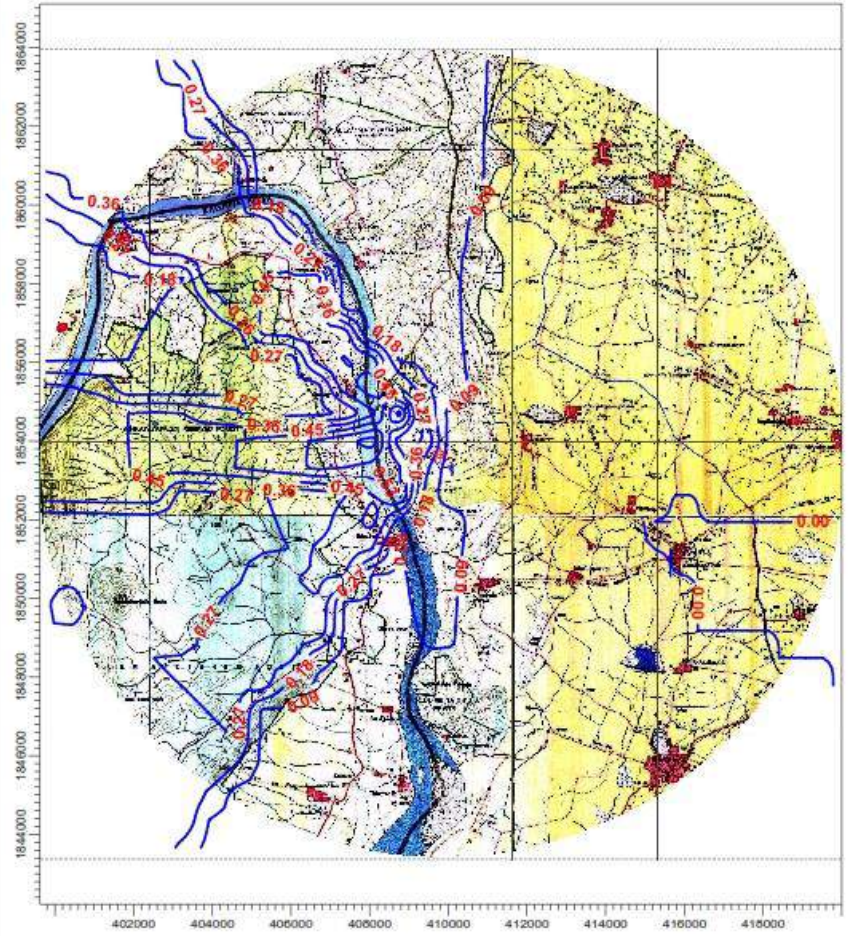
SOURCES 1	M/s CRUX BIOTECH INDIA (P) LIMITED	
RECEPTORS 1600		
Concentration	SCALE: 1:115,000 0 4 km	
MAX: 2.65563 ug/m^3		

AERMOD View - Lakes Environmental Software

G:\Modelling Projects\CRUX BIO EXPANSION\SOx\SOx.isc

PROJECT TITLE:

NET RESULTANT GLC'S OF NOx DUE TO PLANT



SOURCES **1**	**M/s CRUX BIOTECH INDIA (P) LIMITED**
RECEPTORS **1600**	
Concentration	SCALE: 1:115,000 0 4 km
MAX: **0.80127 ug/m^3**	

AERMOD View - Lakes Environmental Software

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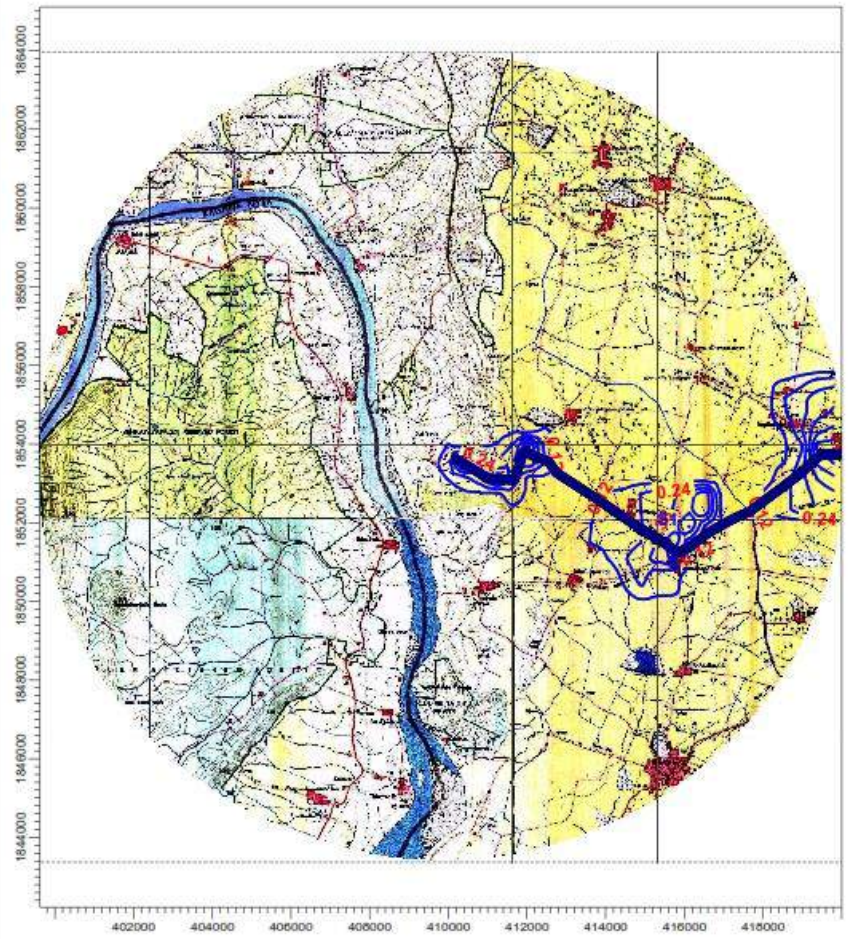
PROJECT TITLE:

NET RESULTANT GLC'S OF NOx DUE TO VEHICULAR EMISSIONS



SOURCES 1	M/s CRUX BIOTECH INDIA (P) LIMITED
RECEPTORS 1600	
Concentration	SCALE: 1:115,000 0 4 km
MAX: 1.0823 ug/m^3	

AERMOD View - Lakes Environmental Software

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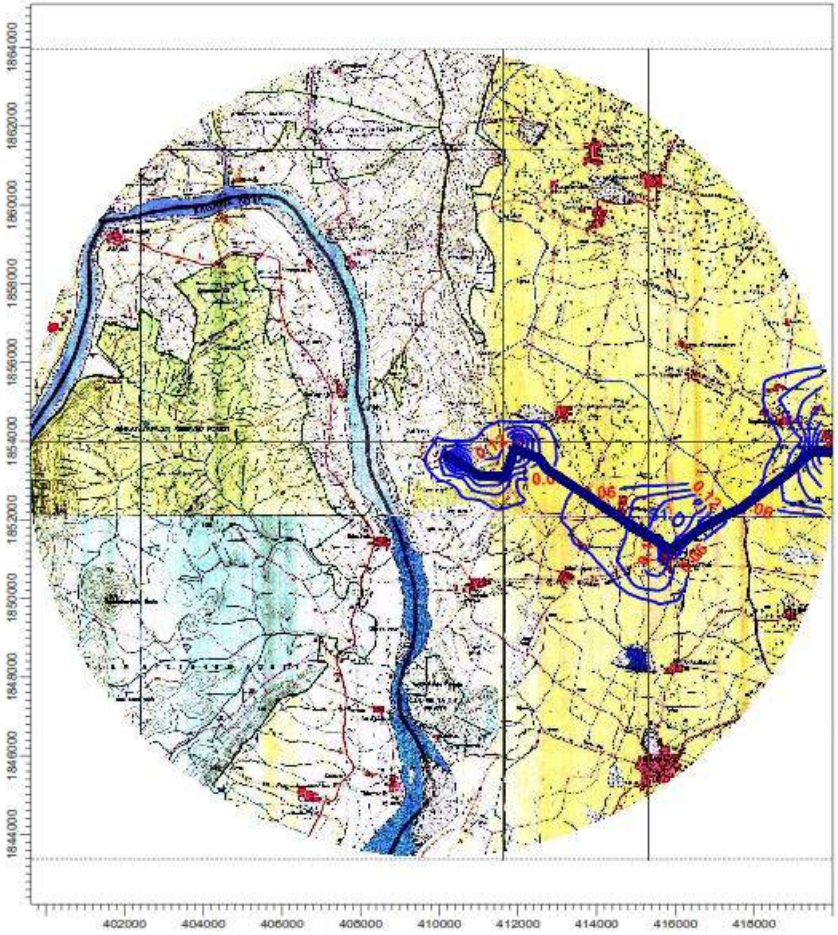
PROJECT TITLE:

NET RESULTANT GLC'S OF CO DUE TO VEHICULAR EMISSIONS



SOURCES 1	M/s CRUX BIOTECH INDIA (P) LIMITED	
RECEPTORS 1600		
Concentration	SCALE: 1:115,000 0 4 km	
MAX: 0.53739 ug/m^3		

AERMOD View - Lakes Environmental Software

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ANNEXURE - 9

REPORT OF OCCUPATIONAL HEALTH STATUS OF EMPLOYEE

Name:	Mr. N.Jaggarao	
Employee ID:	2	Designation: Supervisor
Department:	Admin	Sex: M
Height (In cms):	166	Age (yrs): 48
Weight (In Kgs)	72	Section: Facilities

Vision

Visual Acuity (Distant Vision)
(With or Without glasses)

Right Eye	6/6	
Left Eye	6/6	
Colour Blindness	NAD	
Squint	NAD	

Ears

(Audiometry)

Noise induced Hearing loss	Normal Hearing

Respiratory System

A. Spirometry

Parameters	Measured	Predicted
FVC (Litres)	4.9	
Tidal Volume	300 ML	
TLC (Total lung Capacity)	5.9 L	
Conclusion	WNL	
B. Skiagram of Chest	NAD	

Circulatory System

Pulse	68/M	
Blood Pressure (mmHg)	120/80	
ECG	NAD	

BIOCHEMICAL PARAMETERS

A) Urine

Specific Gravity	1.030	Protein (gm/l)	NEG
PH	6.0	Bilirubin	NEG
Blood	NEG	Ketones	NEG
Leucocytes	NIL	Glucose	NEG
Nitrite	NEG	Ketones	NO
B) Random Blood Sugar (mg/dl)	90		
Remarks	FIT		

MEDICAL OFFICER
AREA HOSPITAL
NANDIGAMA, Krishna Dt.

Name	: Mr. N.JAGGARAO	Register On	: 21/06/2017 5:36 PM
PID No.	: MAP6945795	Collection On	: 21/06/2017 5:39 PM
SID No.	: 648882104	Report On	: 21/06/2017 8:28 PM
Age / Sex	: 48 Year(s) / Male	OP / IP	: OP
Ref. Dr	: C/O GOVT		

MEDALL

LABORATORY REPORT

Investigations	Observed Values	Unit	Biological Reference Interval
HAEMATOLOGY			
Complete Blood Cell Count			
Haemoglobin (EDTA Blood/Automated Blood cell Counter)	14.8	g/dL	13.5 - 18.0
PCV (Packed Cell Volume) / Haematocrit (EDTA Blood/Automated Blood cell Counter)	45	%	42 - 52
RBC Count (EDTA Blood/Automated Blood cell Counter)	5.0	mill/cu.mm	4.7 - 6.0
MCV (Mean Corpuscular Volume) (EDTA Blood/Automated Blood cell Counter)	90	fL	78 - 100
MCH (Mean Corpuscular Haemoglobin) (EDTA Blood/Automated Blood cell Counter)	30	pg	27 - 31
MCHC (Mean Corpuscular Haemoglobin concentration) (EDTA Blood/Automated Blood cell Counter)	33	g/dL	32 - 36
RDW-CV (EDTA Blood/Automated Blood cell Counter)	**11.7**	%	12.2 - 15.4
Platelet Count (EDTA Blood/Automated Blood cell Counter)	2.58	lakh/cu.mm	1.5 - 4.5
MPV (Blood/Automated Blood cell Counter)	8.1	fL	7.9 - 13.7
Total WBC Count (TC) (EDTA Blood/ Automated Blood cell Counter)	13400	cells/cu.mm	4000 - 10500
Differential Leucocyte Count			
Neutrophils (EDTA Blood/Automated Blood cell Counter)	69	%	40 - 75
Lymphocytes (EDTA Blood/Automated Blood cell Counter)	26	%	20 - 45

REPORT DISCLAIMER

1.The results reported here in are subject to interpretation by qualified medical professionals only.
2.Customer identities asre accepted provided by the customer or their representative.
3.information about the customer's condition at the time of sample collection suchas fasting, food consumption, medication, etc are accepted as provided by the customer or representative and shall not be investigated for its truthfulness.
4.If any specimen/sample is received from any others laboratory/hospital,its is presumed that the sample belongs to the patient identified or named.
5.Test results should be interpreted in context of clinical and other findings if any.In case of any clarification /doubt , the refrering doctor/patient can contact the respective section head of the laboratory.
6.Results of the test are influenced by the various factors such as sensitivity, specificity of the procedures of the tests, quality of the samples and drug interactions etc.,
7.If the test results are found not to be correlating clinically can contact the lab in charge for clarification or retesting where practicable within 24 hours from the time of issue of results.
8.Liability is limited to the extend of amount billed.
9.Reports are subject to interpretation in their entirety.partial or selective interpretation may lead to false opinion.

Name	: Mr. N.JAGGARAO	Register On	: 21/06/2017 5:36 PM
PID No.	: MAP6945795	Collection On	: 21/06/2017 5:39 PM
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Age / Sex	: 48 Year(s) / Male	OP / IP	: OP
Ref. Dr	: C/O GOVT		

MEDALL

LABORATORY REPORT

Investigations	Observed Values	Unit	Biological Reference Interval
Eosinophils (EDTA Blood/Automated Blood cell Counter)	03	%	01 - 06
Monocytes (EDTA Blood/Automated Blood cell Counter)	02	%	02 - 08
Basophils (EDTA Blood/Automated Blood cell Counter)	00	%	00 - 01

CLINICAL PATHOLOGY

Urine Complete Analysis

Colour (Urine)	PALE YELLOW		PALE YELLOW TO DEEP AMBER
pH (Urine)	6.0		4.5 - 8.0
Specific Gravity (Urine)	1.030		1.002 - 1.030
Protein (Urine)	Negative		Negative
Glucose (Urine)	Negative		Negative
Ketone (Urine)	Negative		Negative
Nitrite (Urine)	Negative		Negative
Bilirubin (Urine)	Negative		Negative
Blood (Urine)	Negative		Negative
Urobilinogen (Urine)	NORMAL		Normal Limits
Pus Cells (Urine)	2-3	/hpf	0 - 2

Name	: Mr. N.JAGGARAO	Register On	: 21/06/2017 5:36 PM
PID No.	: MAP6945795	Collection On	: 21/06/2017 5:39 PM
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MEDALL

LABORATORY REPORT

Investigations	Observed Values	Unit	Biological Reference Interval
Epithelial Cells (Urine)	1-2	/hpf	0 - 4
RBCs (Urine)	NIL	/hpf	0 - 2
Casts (Urine)	NIL	/lpf	NIL
Crystals (Urine)	NIL	/lpf	NIL
Others (Urine)	NIL		

-- End of Report --

NAGESHWARARAO-MSC BIOCHEMISTRY
BIOCHEMIST

Dr KIRANKUMAR.E
CONSULTANT PATHOLOGIST

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crux Biotech India (P) Limited
H.No. 8-3-222/C/1, A-26, Madhuranagar,
Ameerpet, Hyderabad-500 038. T.S., INDIA.
Ph: 040-66562830, Cell : 9133300679

CORPORATE ENVIRONMENT POLICY

Resolution: On this day i.e. 17-03-2017, the Board of Directors have taken a decision on Corporate Environment Policy of the Distillery Plant.

CRUX BIOTECH INDIA PRIVATE LIMITED is committed to operate the 60 KLPD Grain based Distillery plant and 2.5 MW Captive Power Plant in Sy.Nos.529 p, 530, 531p, 532p, 536p, 557p, 560p & 564p of Peddavaram Village, Nandigama Mandal, Krishna District, Andhra Pradesh with the following objectives.

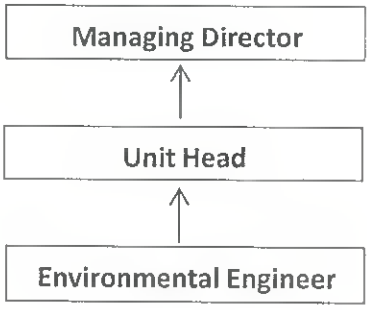
- To produce Rectified Sprit / ENA / Ethanol and to generate Electricity by strictly complying with all the Environmental Regulations.
- Strict monitoring and compliance of the conditions stipulated in Environmental clearance.
- Strict monitoring and compliance of the conditions stipulated in Consent for Establishment/ Consent for Operation issued by SPCB.
- Ensuring Implementation and regular operation of Pollution Control Measures.
- Periodical monitoring of all environmental parameters such as Ambient Air Quality, Water Quality, Noise Levels, Soil Quality, etc. and submission of the same to statutory authorities periodically.
- Maintaining good housekeeping practices.
- Development of greenbelt as per norms.
- The compliance of the EC conditions will be reported to the Managing Director periodically.
- Compliance to Environment Protection Act & Rules
- No Environmental violations will be carried out.

CRUX BIOTECH INDIA PVT. LTD. HYDERABAD

Hierarchy to implement Environment Policy:

An Environmental Engineer will be appointed to look after all environmental issues and ensure compliance with Environmental Clearance conditions will report to Unit Head who ultimately will report to Managing Director. Subsequently it will be discussed in the Board meeting and it will be made aware of the Environmental Policy and compliance on Environmental Clearance / SPCB norms to all. Any non-compliance / deviations will be brought to the notice of the Managing Director.

The following will be the organisation chart pertaining to Environment Policy.



CRUX BIOTECH INDIA PRIVATE LIMITED

RAVI CHANDRAN G
MANGING DIRECTOR

CRUX BIOTECH INDIA PVT. LTD. HYDERABAD